REPORT

OF THE MEETING ON THE

DEVELOPMENT OF PASTURE FROM BUSHLANDS IN WESTERN CANADA

RESEARCH BRANCH

CANADA DEPARTMENT OF AGRICULTURE

REGINA, SASKATCHEWAN

2 AND 3 APRIL, 1964

ATTENDANCE

N.F. Putnam	Field Crops Branch, B.C. Dept. of Agric., Victoria
G.R. Sterling	Alberta Dept. Agric., Edmonton
O. Bratvold	Field Crops Branch, Alberta Dept. Agric., Edmonton
W.G. Corns	Dept. Plant Science, University of Alberta, Edmonton
A.A. Guitard	Experimental Farm, C.D.A., Beaverlodge
J.L. Dobb	Experimental Farm, C.D.A., Beaverlodge
H.A. Friesen	Experimental Farm, C.D.A., Lacombe
A. Johnston	Research Station, C.D.A., Lethbridge
H.J. Hargrave	P.F.R.A., Regina
W.B. Herringer	P.F.R.A., Regina
M. Aaston	P.F.R.A., Regina
M.J. Fitzgerald	P.F.R.A., Regina
T.L. Jermyn	P.F.R.A., Regina
L.C. Munn	P.F.R.A., Regina
W.H. Horner	Saskatchewan Dept. Agric., Regina
P.E. Polischuk	Lands Branch, Saskatchewan Dept. Agric., Regina.
P.O. Moen	Conservation & Development Br., Sask. Dept. Agric., Regina
J.E. Dehm	Field Crops Branch, Saskatchewan Dept. Agric., Regina
D.A. Cooke	Experimental Farm, C.D.A., Melfort
S.E. Beacom	Experimental Farm, C.D.A., Melfort
W.N. MacNaughton	Experimental Farm, C.D.A., Melfort
J.R. Hay	Experimental Farm, C.D.A., Regina
J.B. Cambell	Experimental Farm, C.D.A., Swift Current
R.T. Coupland	Dept. Plant Ecology, University of Saskatchewan, Saskatoon
C.C. Cranston	Soils & Crop Branch, Manitoba Dept. of Agric., Winnipeg
A.A. Watkins	Soils & Crop Branch, Manitoba Dept. of Agric., Winnipeg
J.A. Barr	Manitoba Dept. Mines & National Resources, Winnipeg
R.W. Winstone	Manitoba Dept. Mines & National Resources, Winnipeg
R.W. Clark	Plant Sci. Dept., University of Manitoba, Winnipeg
K. Rasmussen	Research Branch, C.D.A., Ottawa
A. Leahey	Research Branch, C.D.A., Ottawa
R.C. Hodges	A.R.D.A., Ottawa
G. Haase	Economics Branch, C.D.A., Ottawa
J.E.R. Greenshields	Research Branch, C.D.A., Ottawa
F. Whiting	Research Branch, C.D.A., Ottawa

AGENDA

MEETING ON THE DEVELOPMENT OF PASTURES FROM BUSHLANDS IN WESTERN CANADA. APRIL 2 AND 3, 1964 - REGINA, SASK.

APRIL 2 — Chairman - J.E.R. Greenshields
Secretary - F. Whiting

9:00 A.M. - Opening Remarks - J.E.R. Greenshields

9:15 A.M. - Economic aspects of increased beef production.
G. Haase, Economics Branch, C.D.A.

10:00 A.M. - Subject - A.R.D.A. and P.F.R.A. Programs
Subject Chairman - H.J. Hargrave, P.F.R.A.

Role of A.R.D.A. in pasture development
R.C. Hodges, A.R.D.A.

- Role of P.F.R.A. in northern pasture development.
M. Aaston, P.F.R.A.

11:15 A.M. Subject - Provincial Programs in Northern Pasture Development.
Subject Chairman - P.E. Polischuk, Sask. Dept. Agric.

- British Columbia - N.F. Putnam, B.C. Dept. Agric.

- Alberta - G.R. Sterling, Alta. Dept. Agric.

- Saskatchewan - P.O. Moen, Sask. Dept. Agric.

- Manitoba - A.A. Watkins, Man. Dept. Agric.

12:00 P.M. Lunch

1:15 P.M. - Continue with Subject

2:15 P.M. Subject - Ecology of Northern Areas.
Subject Chairman - J.B. Campbell, Research Branch, C.D.A.

- Northern pasture development before 1950.
J.B. Campbell, Research Branch, C.D.A.

- Poplar invasion of pasture land - A. Johnston, Research Branch, C.D.A.

- Use of herbicides in pasture management - H. Friesen, Research Branch, C.D.A.

- Response of native and introduced species to grazing in wooded areas. - R.T. Coupland, University of Saskatchewan.

- Mechanical and chemical control of silverberry (wolf willow) (Elaeagnus commutata) on native grassland - W.G. Corns, University of Alberta.

3:45 P.M. Subject - Research and Development of Northern Pastures in Recent Years.
Subject Chairman - W.N. NacNaughton, Research Branch, C.D.A.

- Melfort - D.A. Cooke, Research Branch, C.D.A.

- Beaverlodge - J.L. Dobb, Research Branch, C.D.A.

APRIL 3

9:00 A.M Subject - Problems Encountered in Pasture Development.
Subject Chairman - A.A. Guitard, Research Branch, C.D.A.

- Manitoba - A.A. Watkins, Manitoba Dept. Agriculture

- Saskatchewan - P.E. Polischuk, Saskatchewan Dept. Agriculture

- Alberta - G.R. Sterling, Alberta Dept. Agriculture

- British Columbia, N. Putnam, B.C. Dept. Agriculture

- P.F.R.A. - W.B. Herringer, P.F.R.A.

10:30 A.M. - Break up into regional groups to prepare recommendations on research and development for the consideration of the meeting.

12:00 P.M. - Lunch

1:15 P.M. - Consider and discuss group recommendations.

3:30 P.M. - Agree on the disposition of each recommendation accepted by the meeting.

Chairmans' Remarks

J.E.R. Greenshields

The development of pasture land in the northern region of the Prairie Provinces and the Peace River area of B.C. is taking place at an increasing rate each year. Most of the development is on grey-wooded soils where problems of regrowth and soil fertility show up immediately. The Research Branch of the Canada Department of Agriculture are striving to get the answers on how to handle this land to the best advantage and P.F.R.A., A.R.D.A., and the Provincial Governments are also working on various parts of the transition of this land.

The Research Branch must accept the main research job as their part in this development. We feel the time has come when all those involved should meet, bring each other up to date, assess the problems and make recommendations for their solution.

It is not my purpose to talk at this time about pastures as such but rather to discuss this meeting with you and tell you what I hope we will accomplish during the next two days. The first day will be mainly spent in getting background on accomplishments, problems and in general in bringing each other up to date. While on the second day, we will define and analyse our problems and make recommendations regarding their solution. All opinions will be welcomed, challenged and accepted or rejected.

Mr. Gordon Haase will lead off with a talk on "Land Requirements for Beef Production in 1980". While we in the Research Branch do not do research in economics, any developmental program such as we are about to analyse must take economics into account or it is bound to fail. Let us make the best possible use of the next two days! History will record our success.

Some Implications of the Demand for Beef in Canada in 1980

G. Haase, Economic Branch, C.D.A.

The number of private decisions and public policies hinge on the future level of beef consumption. In view of the general departmental interest a review of the beef situation has now been made in order to estimate some of the factors that will be of interest to the industry.

The factors which determine the demand for beef are:

a) total Canadian population;
b) per capita consumption; and
c) the net international trade in beef.

There are a number of estimates of what the population of Canada will be in 1980. The concensus of these indicates a population of 27 million in 1980 which allows for a net immigration rate of 25 thousand per year.

During the past five years the average consumption of beef and veal per person in Canada was about 75 pounds per year. There are a number of techniques for estimating the trend of this figure until 1980 and these estimates generally fall between 90 pounds and 100 pounds per person per year. The most probable figure seems to be in the neighborhood of 95 pounds per capita and this level of consumption of beef and veal is incorporated into the estimate.

It should be noted that this level of beef consumption depends upon two general conditions. In the first place, the present level of prosperity and income is presumed to improve throughout the forecast period, and secondly, it is assumed that beef prices will not get out of line one way or the other with other meats and meat substitutes.

During the past five years net exports of live cattle from Canada amounted to about 450 thousand head per year on the average mainly to the U.S. It is most difficult to forecast what this export trade will be in the future and a modest increase of about 600 thousand head per year has been incorporated into this forecast.

When these forecasts are translated into total meat requirements in 1980 there is an indicated demand for 2.565 million pounds at that date which represents an increase of about 90 per cent over the consumption in the recent period. It is estimated that about 125 million pounds of the future total will be represented by veal which leaves about 2.440 million pounds of beef in the 1980 estimate.

Taking into account possible improvements in carcass weight, this meat requirement translates into a total slaughtering and export of cattle and calves of about 6.3 million head as compared with an average of about 4.0 million head per year in the recent period.

These requirements in turn taking into account other improvements in production technique indicates a total cattle inventory on farms in Canada in 1980 of about 18 million head. This compares with an average inventory of 11.5 million in the recent period. The entire increase is expected to take place in the beef herd since no increase in the number of dairy cows is anticipated in order to meet 1980 requirements for dairy products.

Of immediate concern is the additional forage and feed grain that will be required to support the anticipated increase of about 6.5 million head in the Canada beef herd. In the matter of the country's present forage and pasture resources the current inventory of these is estimated as follows:

(a)	Unimproved pasture in terms of improved pasture equivalent (about 42 million acres of native pasture)	7.7 million acres
(b)	Improved pasture	10.2 " "
(c)	Forage crops	13.8 " "
	TOTAL	31.7 " "

Since the new pasture and forage resources will have to be met mainly from improved land a 50 per cent increase in cattle inventory can be translated in the first instance to a 50 per cent increase in the pasture and forage requirements. However, part of this requirement may be met by better management and the improvement of both native and improved pastures. In the first place, the carrying capacity of some range lands can be increased by such management practices as reseeding and the use of supplementary cultivated pasture in certain seasons. The yield of improved pastures can be increased by the use of fertilizer and by drainage.

Taking the relevant factors into consideration it is estimated that an additional 11 million acres of improved pasture and forage will be required by 1980 to support the cattle inventory that is forecast for that date. In the matter of feed grain requirements it is estimated that an additional 4 million acres will be required by 1980 to produce the output that is forecast. This estimate takes into account possible changes in feeding efficiency and per acre yields over the period.

In summary these forecasts indicate an additional 6 1/2 million beef cattle on Canadian farms by 1980 which will require an additional 15 million acres of improved land allocated to the production of beef at that date, in order to meet the anticipated consumption of beef of 95 pounds per capita for a total population of 27 million.

Economics Division,
April 13, 1964.

A.R.D.A. & P.F.R.A. PROGRAMS

Chairman H.J. Hargrave - P.F.R.A.

Introduction

Government assistance in pasture development and operation differ as to province - in B.C., the provincial government and A.R.D.A.; in Alberta, the provincial government and A.R.D.A. and private livestock associations; in Saskatchewan, the provincial government and A.R.D.A., P.F.R.A., and co-operatives; in Manitoba, mainly P.F.R.A.

P.F.R.A. Community pasture program - P.F.R.A. is operating 85 pastures, 64 of which are in Saskatchewan. These pastures cover 2.5 million acres of land, with the average size being 30,000 acres, but varying in size from 10,000 to 143,000 acres. The average carrying capacity is 14 acres per head of cattle, but varying from one acre to more than 50 acres per head. In 1964 these pastures will graze 15,000 cattle owned by 7500 separate owners. Of these cattle about 50,000 cows will be red on pasture utilizing 1500 bulls owned by P.F.R.A. and 400 rented from farmers. It is planned to breed 5000 cows by A.I. in 1964 and with the expectation that the use of A.I. will increase in the future.

The current construction program involves 350,000 acres all of which is in the Parkland area. Future possibilities include cooperating with the Indians and Department of Indian Affairs to make about 4 million acres of Indian Reserve available for grazing.

ARDA and Pasture Development

R.C. Hodges, A.R.D.A.

I will not dwell on the philosophy behind the ARDA program for I think most of you here are familiar with the general reason there is such a program.

You are aware also that it is a joint program in which the initiative and operational responsibility lies with the provinces. The federal government role is largely to assist in cost-sharing and to provide a certain amount of technical and administrative assistance.

The Act itself has three main parts, a section on Rural Development, one on Soil and Water Conservation and one on the Alternative Uses of land.

The creation of community pastures falls under the last of these and is one of the main methods available to us to effect adjustments in the use of lands that are submarginal for cultivation. Reforestation, where the environment is suitable and to a lesser extent, recreation and wildlife uses are the other main alternatives along with grazing, to arable agriculture.

There are two main purposes for the land adjustment program in ARDA:

(1) It is aimed at improving income and employment opportunities in rural areas and in general to increasing the standards of living of our farm and rural non-farm population, and

(2) It is aimed at making more effective use of our lands.

The creation of community pastures has proved to be a useful tool in achieving these aims, and it is a double-edged tool for it takes poor land out of "circulation" and at the same time provides additional pasture for the surrounding farmers who, one hopes, will substantially benefit from the opportunity to enlarge their herd and therefore their farm business.

The displacement of those who leave the land, however, is a serious problem, a by-product of the land adjustment. In other words, in order to enable some farmers to be better off, others must leave the area; and there are many ramifications to this movement or displacement of people about which we are much concerned. Those who leave agriculture entirely and seek work in another field of endeavour are often ill-equipped to compete for jobs which require different skills. I could say much more about this topic but it is appropriate that we adhere to the subject of the day.

To give some idea of the ARDA pasture program thus far, here are some figures on a provincial basis.

Area of Community Pastures - ARDA

Province:	Number of ARDA Pasture Projects Approved (23 March '64)	Areas Purchased Under ARDA (acres)	Crown Owned Areas In Pastures (acres)	Total Area of ARDA Pastures (000 acres)	Total Federal Cost Share ($)
Nfld.	1	-	25,700	25.7	30,000.00
P.E.I.	-	-	-	-	-
N.S.	6	1,650	4,160	5.8	49,379.95
N.B.	3	2,490	-	2.5	51,236.38
Que.	1	200	300	.5	38,916.67
Ont.	2	2,780	-	2.8	67,450.00
Man.	-	-	-	-	-
Sask.	34	90,390	109,880	200.3	2,426,859.00
Alta.	11	51,970	186,400	238.4	787,862.00
B.C.	5	800	218,600	219.4	121,400.00
CANADA (Total)	63	150,280	545,040	695.4	3,573,104.00

These tables indicate that the actual amount of land converted to pasture use is not very significant as yet except in Saskatchewan but we must remember that the program is not even two years old.

In conclusion may I emphasize again that ARDA is primarily interested in rehabilitation, i.e. the improvement of the lot of rural people, and where land use adjustment such as the conversion of poor arable land into pasture can contribute to this aim so much the better.

It is doubtful whether the use of public funds can be justified to create new agricultural land per se as the normal process of economic development largely through the investment of private capital will in all likelihood provide the additional beef that the market growth will demand in the next twenty or thirty years.

The Role of P.F.R.A. in Northern Pasture Development

M. Aaston, PFRA Regina

The role of the P.F.R.A. in northern pasture development at the outset of the P.F.R.A. pasture program was the establishment of pasture units to meet local needs and also to establish reserve pasture units. The purpose of the reserve pasture units was to form a bulwark against extreme drought conditions which would affect the heavily livestock populated areas of the south. This was accomplished mainly through horizontal expansion. Improvement work during the initial construction of pastures consisted of boundary fencing, a limited amount of cross fencing and water development, grass seeding of abandoned farmlands and the construction of cattle handling facilities. The cattle population of the north since the beginning of the pasture program has however increased to the extent whereby the reserve pasture units are stocked to their present carrying capacity.

The P.F.R.A. has apparently reached the limit of horizontal pasture expansion in Saskatchewan and will probably reach this limit in the not too distant future in Manitoba. The present day role of P.F.R.A. in northern pasture development therefore is to continue horizontal expansion to some degree and to go ahead with the best known improvement methods in a vertical expansion program. This program is designed to increase the carrying capacity of the existing northern pasture units which will take care of local livestock needs and also keep far enough ahead of the grazing demand in order to take care of any southern emergency requirements. More can be obtained for the dollar in the improvement of northern or parkland pastures than in the improvement of pastures in the open plains area because of conditions in the parkland conducive to much higher forage production returns. Greater emphasis is therefore being placed on the improvement or development of northern pastures.

What improvement or development work is being done and what methods are used by P.F.R.A. in the role of northern pasture development? The five main fields of pasture improvement which come into play in this program are as follows:

1. Additional cross fencing.
2. Increased stockwater development.
3. Construction of more and larger cattle handling facilities.
4. Reclamation of flooded areas.
5. Land clearing and brush control.
6. Cultivation and forage seeding.

The following is a brief outline of methods and techniques which have been or are being adopted by P.F.R.A. for each field of pasture improvement.

Cross Fencing - Additional cross fencing is necessary to handle larger numbers of livestock and to regulate grazing intensities according to soil, vegetative and topographic conditions. The use of various types of suspension fences of a design similar to the one developed by the Experimental Farm, Swift Current is being considered for this work.

Stockwater Development - Increased stockwater development is necessary for a better distribution of grazing animals. An attempt is made wherever possible to locate stockwater at points whereby livestock do not have to walk a distance to water more than one and one-half miles on flat terrain or one mile on rough terrain. The choice of the type of stockwater facility is in many cases dependent on cost and in this order; dugout, dam, shallow well, deep well and dugout with well.

Cattle Handling Facilities - Larger corrals are necessary to facilitate the handling of an increased number of livestock. An attempt is made to locate corrals near good access roads and at the same time serve as many fields as possible.

Reclamation of Flooded Areas - A large acreage in northern P.F.R.A. pastures consist of flooded lands and peat bogs. A certain acreage has been improved through drainage and consideration is being given for an expanded program in this phase of work.

Land Clearing and Brush Control - Approximately one-half million acres in P.F.R.A. pastures are covered with poplar growth of various sizes and densities. Land clearing in dense stands of growth greater than four inches in stem diameter is being done on a reasonably large scale by the ball and chain method followed by burning and herbicidal spraying. This method of clearing was started in 1956 and has gained momentum in improving northern P.F.R.A. pastures in the ensuing years. At the present time approximately six thousand acres are treated by this method each year. A stepped-up improvement program by the use of this method is being considered. A new method of land clearing has recently been adopted by P.F.R.A. for use on growth less than four inches in stem diameter. The growth

is smashed down and cut by a unit termed a roller crusher. The follow-up operations for this method are the same as for ball and chain clearing. The cost per acre is approximately the same as ball and chain clearing being about $3.00 per acre. The method is also adaptable to stony soil conditions where heavy offset serrated disc equipment or rotary type cutters cannot be used. Approximately two thousand acres of land clearing per year by this method is being considered. Land clearing by the conventional method with the use of blade cutters and dozers is being limited to fenceline clearing, strip clearing for management purposes and on small acreages with scattered poplar bluffs. New land clearing methods overrule the use of conventional equipment for large scale land clearing when overall cost comparisons are considered.

Cultivation and Forage Seeding - Cultivation and forage seeding has been generally confined to abandoned farmlands within the boundaries of P.F.R.A. parkland pastures. Since approximately three acres of land clearing can be done for the cost of cultivating and seeding one acre, it therefore seems reasonable to concentrate on land clearing operations at the expense of cultivation and seeding. Although tame grass production may triple native grass production consideration must be given to pasture management difficulties on lands heavily infested with brush. A limited amount of forage seeding is being done on peat and light soils which are in low production. A seeding unit designed by the Engineering Department of the Oregon State University and manufactured in the P.F.R.A. Moose Jaw Plant is being used for this work. The unit is designed to pack loose soils and maintain optimum seeding depth in one operation. Consideration is being given for the manufacture of additional units like this for more extensive future forage seeding operations.

Conclusion - The methods as outlined for the various phases of northern pasture development may be considered quite efficient and practical and the most economical of present day methods. There is however, a great need for research for the development of better techniques and the design of better equipment for all fields of northern pasture development. Every dollar saved per acre in land clearing, brush control, cultivation and forage seeding and a saving of a few dollars per mile for fencing would run into the saving of millions of dollars in the complete development of northern P.F.R.A. pastures.

Provincial Programs in Northern Pasture Development
P.E. Polischuk - Chairman

Northern Pasture Development Report For British Columbia

N.F. Putnam, B.C. Department of Agriculture

For many years the B.C. Forest Service has been responsible for administering the grazing of lands in the Southern Interior, which are primarily forest areas, so that in the mid 1950's when there developed an interest in grazing burned-over grazing areas in the Peace River district the Forest Division also became involved along with the District Agriculturist. In 1952 the Land Utilization Division of the Department of Lands and Forests did carry out a broad survey in the Peace River and at that time recommended certain parcels of land be set aside as unfit for farming so that they would not be opened up for settlement and they recommended further that there might be limited grazing on some of these areas. In the early 1950's two forest fires in the area destroyed large areas of timber and wild grasses and forbs covered the burns and farmers in the immediate vicinity started ranging cattle on the native regrowth and they asked that the government step in to administer these grazing areas. At the same time the Forest Service stepped up forest protection activities in the area generally and put more strict limitations on the use of these burned-over areas for grazing.

By 1960 the Department of Lands and Forests instituted a more definite policy on grazing and they did set aside areas designated specifically for future pasture development work and some development work was actually done, such as cross fencing, clearing trials and dugout construction. To date five of these areas are under development in co-operation with the Federal Government under the ARDA scheme.

In the early stages of development there were many problems associated with development of the pasture, including clearing methods, land preparation, seed mixtures and general soil fertility, so the Forest Service contracted the Beaverlodge Experimental Station, which gave very valuable assistance in making recommendations and initiating some applied research projects to solve the more pressing problems. They have continued and expanded this work and the information derived is being put to practical use on most recent development practises.

As there are still many problems associated with development of these pastures in Northern B.C. we hope to have the continued support of the Research Station to help in the solution, and we certainly appreciate the work they are doing.

As I have indicated the Grazing Division of the B.C. Forest Service has had long experience in administering grazing on Crown lands in the southern part of the Province where there is more of a multi use problem of range. The Grazing Division has continued to administer community pasture development in the northern areas and our Department has co-operated with them. Therefore I must also acknowledge the assistance given by W.C. Pendry of the Forest Grazing Division in preparation of this report.

Problems Encountered in Developing Pastures in Northern British Columbia

N.F. Putnam, B.C. Department of Agriculture

I have already enumerated the general problems encountered in developing pastures in northern forested areas of our Province and many of these are similar to and have been covered in more detail by representatives of the other provinces.

I think one of our real problems is that the areas being set aside for pasture development are problem sites to begin with for agricultural development and most of the areas it seems to me have severe limitations for any agricultural pursuit after they have been cleared. In general, they have poor soils, low in fertility, rocky or poorly drained, etc. Certainly this is the case in our Groundbirch community pasture site now under development.

Another point which I think we will eventually have to consider, although probably not of immediate concern at this stage, is how long the community pastures now being established will be left for this use. I can foresee in the not too distant future that some of the better soils on which we are now establishing community pasture may be eventually used for cash cropping as well as forage production under a mixed farming enterprise. Furthermore in developing these community pastures we cannot ignore the overall effect on live stock production in the area and we must look to total feed production, including the winter feed supply. Most of these northern areas have a long winter feeding period and any program for encouraging increase in live stock numbers must not only include summer pasture but must encourage development of land to produce forage and/or concentrates for the winter feeding period or for finishing live stock for market.

ALBERTA PROGRAMS AND PASTURE DEVELOPMENT

G.R. Sterling, Alberta Dept. of Agriculture

The Alberta Government embarked on a pasture development program early in 1957 under the Conservation and Utilization Committee, which obtains its authority from the Utilization of Lands and Forests Act. Several pastures were started and some completed under this administration prior to the passing of the ARDA Act. When the ARDA Act came into being, and the Agreements were signed, the pasture development project was increased by approximately two fold.

Since the inception of the pasture program, interest has been very keen amongst local people, and keenly supported by municipalities and counties. As a result of this interest, we have a long list of pastures waiting development. This list is sufficiently long to keep us going for the next five years at least unless our program is stepped up considerably. New requests are also coming in all the time.

Our pastures are located from the southern border of the province to as far north as Township 87, which is generally near Dixonville, Alberta. The program includes the development of irrigation pastures as well as dryland pastures in those parts of the province where irrigation is applicable. In the northern part of the province we are developing bush land pastures generally in areas that are not too suited for conventional types of agriculture. These previously cultivated areas are seeded to suitable forage mixtures, and we have embarked on a small scale land clearing project on some of our northern pastures. To date our clearing has been limited to clearing land in order to join existing small previously cultivated areas to facilitate better grazing of the previously cultivated acres. In other words, the clearing has been done in a way to facilitate the handling of cattle, and consequent better grazing. At the same time, of course, more land has been brought under improved pasture. To date, we have not embarked on large scale clearing. Areas to date have been limited to approximately 200 acres per pasture per year.

Pastures are presently being acquired and developed under the Conservation and Utilization Committee. They are then turned over to the Department of Lands and Forests for administration. The Lands Department administers all of the Crown lands in Alberta. Pastures are developed by acquiring the land at current market prices, seeding the cultivated acres to tame grasses, clearing the fence lines, building the fences and corrals, and other facilities and accommodation needed for the caretaker. Our main objective to date has been to assist local governments (M.D., County, or I.D.) with problem areas and to move people out of such areas. When this has been done, we then make the best use of the land depending on its capability, and in most cases this has been community pastures.

Development of Bushland Pasture
Regina April 2, 1964.

P.O. Moen

SUMMARY OF SASKATCHEWAN ACTIVITY

History:

First provincial community pasture set-up at Matador in 1922.

P.F.R.A. became very active in large community pastures in sourthern half of Saskatchewan in 1937.

By the early 1950's it became obvious that livestock production in northern Saskatchewan was being seriously handicapped by lack of grazing facilities. Native bushlands which were available for pasture were unproductive and farmers on 1/4 or 1/2 section units could not afford to clear lands for pasture purposes.

Northern Pasture Program:

First pasture development work undertaken at Erwood near Hudson Bay in 1956 approximately 1,500 acres of light sandy soils cleared of aspen poplar, broken and seeded to mixture of brome, crested wheat, creeping red fescue, timothy, alfalfa, white dutch clover. Good catch, still quite productive in 1963.

In 1957-58 some 3,000 acres of grey wooded land at Bertwell (south of Hudson Bay) was broken and seeded to forage. Establishment was slow but after two years excellent stands on entire area. Also did 1,000 acres at Barrier Lake (south of Tisdale). This area was extremely stoney but had good layer of leaf mould. Grass established very rapidly.

By end of 1962 some 34,000 acres of perennial forage had seeded in northern pastures.

In 1963 more than 24,000 acres were seeded to forage of which 20,000 acres were cleared of brush prior to seeding. These pastures are widely distributed across the north half of the province.

Procedures and Techniques:

Clearing carried by two basic methods:

(a) Swather with a weighted chain and bulldozed into windrows

(b) Cut with "V" type blade cutter and windrowed with toothed pilers

Virtually all breaking is done with heavy duty Rome disc plows. Number of operations required varies with conditions. Broken lands are compacted with drum-type rollers.

- Seeding done with conventional disc drills.
- Clearing of brush has been done at all times of the year.
- Breaking and seeding has been done continuously from spring break-up to freeze-up.
- Some fertilizing done, mostly on old cultivated fields scattered throughout cleared areas.
- Some attempts made at controlled burning, but has been found to be very difficult to carry out on a large scale. Best suited to small acreages on individual farms.
- Some rotary brush mowing done. No real benefit, since plants come back vigorously from the roots.
- Some aerial chemical spraying done using 2 lbs. 2,4-D.
- Excellent kill on Western Snowberry
- Good kill on regrowth willow and aspen.
- Also tried spraying mature aspen poplar (10' to 25' high) Fair kill on taller trees; small trees apparently received no chemical. Tried burning this area standing but results were generally poor.
- Forage mixtures have been altered. Timothy dropped from the mix. In 1963 we seeded three different mixtures for seasonal rotational grazing.

Development of Bushland Pastures in Manitoba

G.A. Watkins, Manitoba Dept. Agriculture

Extensive areas of Manitoba are covered with bush which has restricted agricultural utilization of these lands since settlement began. Over the years the crawler type tractor equipped with a cutting blade and piler became the accepted mechanical bush removal method. This operation can be expensive and the rate of removal is limited. Farmers using this method generally try to confine bush clearing to the lands considered suitable for cereal crop production.

The Province of Manitoba has recently carried forward demonstrations of three alternative methods of bush control in the Interlake area of Manitoba to determine an economic and extensive technique for improving bush land, pastures and forage crop development on low productivity lands not suited to cereal crop production.

The programs conducted to date have included:

- Airspray
- Ball and chain
- Rolling crusher (Fleco chopper)

All projects were carried out primarily on privately owned land in an effort to demonstrate their application to actual farm conditions. Additional acreage, however, was airsprayed in the Sleeve Lake pasture in 1958 and 1960.

The Sleeve Lake pasture demonstration project included 1,150 acres on Sections 19 and 20-23-5W, which permitted a 2 mile run in a north-south direction.

Summary of Flight Log

Date	Flights	Time	Rate	Wind	Temperature	Humidity
14/6/58	2	a.m.	8 oz.	0-4	45	90
14/6/58	2	a.m.	16 oz.	5	47	85
14/6/58	2	a.m.	24 oz.	5-10	50	80
15/6/58	7	p.m.	24 oz.	0-10	43	90
16/6/58	8	a.m.	32 oz.	0-10	45	95-71
16/6/58	8	a.m.	24 oz.	5-0	55	84-60
16/6/58	2	p.m.	48 oz.	5-10	48	92
16/6/58	2	p.m.	64 oz.	5	50	88
16/6/58	4	p.m.	28 oz.	0-5	50	84
17/6/58	5	p.m.	28 oz.	0-5	35	96
17/6/58	6	p.m.	28 oz.	5-10	37	100

Additional work was carried out with farmer co-operators:

Name	Flight		Temperature	Humidity
Gareau	9	(15 Wind)	70	70
Devisscher	5		55	45
Frazer	9		47	50
Kunselman	0		65	75
Palsson	13		70	45
Benidictson	4		65	70

Total acreages: Sleeve Lake - 1150
Co-operators - 1050 2,200 acres

The initial evaluation of the treated areas in 1959 indicated good control. The effect of the herbicide application was most uniform in the Sleeve Lake project. At this time it was not possible to visually detect except in heavy bush any variance between the areas sprayed at rates of 1 1/2 to 4 pounds application of acid equivalent per acre. All of the small and medium stands defoliated in the first year did not show signs of leafing out and were considered killed. In the heavy stands, 5"-7" stems and 30'-35' high, some top leafing out was noted where lighter rates were applied. It was evident that the leaves on the trees at time of spraying had acted as an umbrella and prevented treatment to some extent of the young trees and shrubs at ground level on the initial application.

The work carried out on individual farms showed more varied results but generally was considered good. Stands of oak appeared to be hard to control. On Mr. Devisscher's farm the oak appeared to be making a complete recovery as did some of the large poplar. The combined effect of low temperature, low humidity and wind at the time of spraying was thought to have influenced the results.

The underbrush protected by the umbrella effect of the leaf canopy at the time of spraying, and without competition of the larger trees, was aggressive on individual farm locations as was the case at Sleeve Lake. One project, carried out on regrowth after burning, resulted in full control of top growth but here again did not control the underbrush and regeneration.

The grass invasion was rapid when the leaf canopy was removed permitting light to reach the ground. Kentucky blue grass, native to the area, was predominant and became established quickly.

Respraying of the Sleeve Lake area was carried out in 1960. As was expected, control of the underbrush and regrowth was achieved.

In 1963 most of the area formerly covered with sampling stands of poplar was clear of bush and was replaced by grass.

The dead trees which had rotted at ground level, have been broken down by the combined effects of weather and cattle grazing in the area. In the medium stands, the breakdown is not complete, but the process is still going on. The trees are dead and more deadfall occurs with every strong wind as additional rotting takes place. There is some regrowth occurring, enough to suggest a respray operation should be carried out to maintain control.

The heavy stands are similar except that some leafing out occurred at the apex of some of the larger trees in 1962 and 1963, indicating a complete kill of the large poplar has not been accomplished as yet. Evaluating the entire project, this is not considered serious as the grass has invaded these areas and is available for grazing.

The average cost for the double application has been $4.80 per acre, or approximately $1.00 per acre per year.

Spray mixture

3/4 gallon diesel oil
2 gallon water
24-32 oz. 2,4-D ester

The total cost of application and material could be expected to range around $3.00 per acre.

Ball and Chain

This method was again demonstrated on 2400 acres in co-operation with 36 local farmers on private land in the Interlake area. The cleared area per farm ranged from 50 to 160 acres. The bush cover encountered varied greatly from poplar saplings and willows to timber 12 to 14 inches in diameter and 70 feet in height. Some experience was also gained in handling stands of spruce, oak and ash by this method.

The ball and chain equipment was on loan from P.F.R.A. in Regina, Saskatchewan. The tractor power was contracted for the job from Manitoba operators. Our experience with tractor units indicates that the most economical operation is possible when the tractors have 200 or more available draw bar horsepower. The equipment when powered by an International TD-25-A and a TD-24 gave satisfactory operation in all classes of bush encountered.

This type of equipment is fast and operates best in medium to heavy stands of bush. Our observations would suggest that stands with 3 inch stems and 2.5 feet high would be the starting point for ball and chain work. The density of the stand influenced the windrowing effect and the extent of the cleared area between the rows. Although costs per acre increased considerably in heavy timber stands, the method was still 1/4 to 1/5 of the cost of the standard mechanical methods available. The rate of takedown in medium bush conditions averaged 12 acres per hour, whereas in timber the rate was reduced to approximately 3 acres per hour. Average cost per acre was $4.93.

The farmer co-operators have adopted many different ways of handling their acreages subsequent to clearing. Two farmers piled the aftermath immediately and effected extremely clean burning of the piled rows in late August of the same year.

Two operations with a Rome plow did a very satisfactory job of breaking the shallow till soils predominant throughout the area with a minimum loss of the leaf matt. In addition this machine did not bring a lot of stones to the surface and permitted the use of farm tillage equipment for seedbed preparation the following spring. Total cost to seeding was approximately $25.00 an acre in one case and $35.00 in the second.

Several farmers piled the material and grazed the area with cattle at a rate of 3 to 4 times the carrying capacity formerly used under bush conditions.

Others grazed the fields just as they were left after ball and chaining. Carrying capacity was generally considered to have been tripled and the animals did not appear to experience too much difficulty traversing the aftermath.

Regrowth and evidence of weed infestation indicates some control method will have to be introduced to maintain increased production where the native stands are relied upon for grazing livestock.

Most of the participants favour complete clearing by piling and burning. The second step would be to break the land and crop it for sometime before seeding down to forage crop. Others favour spraying when accessibility is possible for ground equipment after clearing has been completed.

The original suggested program was to burn the material in the following spring. Fireguards however, were not prepared and generally people in the area are reluctant to burn due to some unhappy experience with uncontrolled bush fires in the past.

Fleco Chopper

The Manitoba Department of Agriculture purchased this equipment in 1963. The unit consists of blades 20 inches apart mounted horizontally across and around a heavily constructed drum approximately 5 feet in diameter and 8 feet long. A heavy "A" frame attaches by bearing mounts to stub shafts centered at each end of the drum. The unit when filled with water or fuel oil weighs approximately 10 tons. The machine is drawn by a dozer equipped crawler tractor in the 150 to 200 H.P. range. The drum rotates and the trees are crushed and severed by the blades against the ground.

Three to four acres per hour can be expected at approximately $4.00 per acre operating costs only considered.

The machine was first demonstrated in July, 1963 on Mr. Proctur's farm at Teulon. Unfortunately, the initial trial was in bush suitable for ball and chain. Growing conditions were excellent and the trees extremely resilient. Heavy rains had softened the ground preventing the shear plate effect necessary to assure severing of the material by the blades. Generally, the trees were only notched and pressed into the soft earth. These conditions increased power requirements and the speed necessary to bring about a chopping effect was not possible. In addition, the area between the blades became compacted with the wet soil preventing desirable blade action. Survey of the work done revealed the machine had not operated effectively even on sampling, poplar and willow. After 112 acres of work the project halted and the machine weathered its paint until December when it was loaned to P.F.R.A. to carry out pasture development under winter conditions.

Several checks made last fall indicate that the summer work may be better than was indicated by earlier observations. The notching and barking of the trees has permitted rapid drying and fast rotting is expected where the material is in contact with the ground.

There would also appear to be some merit in repeating the job on the heavier bush a year later. The break-up would in all probability be satisfactory. Burning is also being considered as a follow-up, however, the close proximity of the material to the ground could restrict the firing effect.

The winter operation, particularly in sub-zero weather was very effective on bush 2 - 2 1/2 inches in diameter. In deep-frost conditions (10° - 20° below zero), the bush was effectively handled even up to three inch material. The small branches shatter well and the severing of the stems by the action of the blades against a firm shear plate of frozen ground was satisfactory. The power requirements were less and speeds up to four m.p.h. were possible.

Observations to date that this machine is best suited to winter conditions. The greatest opportunity for economy lies in the fact that piling will not be required where grazing of native stands is the objective. Control of regrowth by aerial herbicide application should prove feasible and effective. With due care to selection of spray equipment, ground application may be possible.

Durability

After some 1200 acres of work the Fleco machine shows some structural failure at the two center rows of the blade mounting lugs. The lack of reenforcing has permitted some flexing of the main drum, resulting in leakage (blade breakage?) due to fracture of the welding beads anchoring the lugs to the drum. However, due to the job which can be done under favorable conditions with this machine, consideration of structural redesigning to incorporate the required durability is merited

I would again stress that all work carried out has been on a demonstration basis only. We recognize that a large degree of control was lost when the projects were undertaken on private lands in co-operation with farm operators. The evaluation has been made under variable physical and management conditions and lacks the concrete statistical data associated with research projects. In addition, it has not been possible to include complimentary studies (i.e. grazing trials Economics and Ecology) which would have provided a greater depth of usable information. Two new policies have been recently announced in Manitoba to bring about pasture improvement and development.

A land clearing policy using the ball and chain method provides for financial assistance and supervision from the Province to encourage farmers to increase pasture and forage crop production.

The second policy utilizing herbicides conducted through weed control districts is aimed at encouraging pasture renovation. Weeds and woody growth will be treated with an initial application of 2 pounds acid equivalent per acre. The second application must be applied within 2 years at 1 1/2 pounds acid equivalent per acre. Financial assistance and supervision has been provided for under this policy.

It is hoped that these policies will provide incentive to farmers to carry out improvement and development of some crown lands within the terms of reference of the leasing of crown lands policy introduced in spring of 1963.

In summary, all methods indicate that they have a potential use in the development of bushland pastures. The size of the bush and the proposed subsequent land use will influence the choice of method, or combination of methods which will be employed to increase production and improve resource utilization.

ECOLOGY OF THE NORTHERN AREAS

Chairman, J.B. Campbell, Experimental Farm, Swift Current

Introduction

The general topic for this part of the program is "Ecology of Northern Areas". The aspect of the area is dominated by the aspen poplar Populus tremuloides Michx. It is the weed of greatest concern in the development of pasture at the margin of settlement in the Prairie Provinces, although sub-dominants indicate variations from east to west and from south to north. The area of concern is large, extending westward from the Interlake area in Manitoba to the foothills of the Rockies and northward from within the margin of settlement to the pre-Cambrian Shield. This region contains 60-80 million acres of which 15,000,000 to 20,000,000 acres are probably suitable to produce cultivated grasses and legumes, a resource which could support 3,000,000 to 3,500,000 cattle.

Although this entire area has a poplar-dominant cover, there are at least six general types within the association. These can be classified more by the presence of sub-dominant that have more specific demands for climatic and edaphic factors than the aspen poplar. It is possible to classify these through phyto-sociological surveys where species are listed instead of measured as in ecological studies. In fact there is considerable ecological, sociological and taxonomic information which could be used for general classification. However, this information requires correlation and field checking.

Developments before 1950

J.B. Campbell

In the mid-1930's the Canada Department of Agriculture through P.F.R.A. and the Experimental Farm Service established a range survey. A considerable portion of this survey was undertaken in poplar-dominant areas in the provinces of Manitoba and Saskatchewan. The purposes of these surveys were to estimate grazing capacity of natural vegetation, to conduct taxonomic research and to assist management planning on PFRA Community Pastures. This phase of the work has continued intermittently until the present, with more and more studies in the poplar-dominant region during successive years.

In the mid 1940's, a program was proposed to increase the grazing capacity of the poplar-dominant areas within P.F.R.A. community pastures. The few remarks I have for this meeting will be limited to the few experiments undertaken by the Range Research group at Swift Current on the P.F.R.A. holdings, although I know that other investigations were started. I have no doubt that we will hear of those later in this meeting.

We selected three pastures for our work: Beaver Hill about 125 N.E. of Regina, Lakeview on the west shore of Lake Manitoba and near the village of Langruth, and Royal about mid-way between North Battleford and Prince Albert in west-central Saskatchewan. Each of these represented different climatic and edaphic entities, as well as considerable differences in vegetation and features of grazing management.

There were four basic objectives of the Program:

1. To increase the grazing capacity by clearing and regrassing.
2. To provide forage with a high nutrient value for early spring and/or after autumn frosts.
3. To determine the intensity of cultivation necessary to obtain stands.
4. To select grasses which could suppress or compete with regrowth of poplar and other indigenous species.

The operational plan was to clear relatively large areas so that observations or even experimental work could be undertaken with cattle. This plan was not accepted and a much smaller scale program had to be initiated. In total some 220 acres of heavy bush, 65 acres of light bush and 40 acres of a partial burn were cleared, plowed and cultivated with either a bush-plow, Rhoem plow or a complete line of farm equipment. Within a short time after this work commenced, a re-organization of responsibilities within the Experimental Farm Service made it necessary to curtail a considerable portion of the program. However this very preliminary work was the base for a program of development by P.F.R.A. in their poplar-dominant pastures, and commenced when a plan for development was prepared for the Beaver Hills Pasture in 1952. The P.F.R.A. improvement program is operative in several of their pastures at present. You have heard from M. Aasten about this work.

In this short presentation I have attempted to bring out four points:

1. The area of concern is extensive.
2. That although the principal plant is aspen poplar, there are variations which may require special techniques for clearing, special crops, and particular management.
3. There is considerable knowledge of the area based on taxonomic, sociological and ecological surveys, but this information needs correlation.
4. That a limited program of investigation commenced 20 years ago, which gave some leadership to the development of P.F.R.A. pastures.

Poplar Invasion of Pasture Land

Alex Johnston, Research Station, Lethbridge

The historical evidence indicates that the "Parkland" is a vegetation type of fairly recent origin. Certainly, in the historic period, it was much less extensive than now. Comments in the 'Diary' of Peter Fidler, a Hudson's Bay surveyor who wintered with the Peigans in what is now Southern Alberta in 1792-93, appeared to place the southern border of poplar about 60 miles north of present-day Hanna. Poplar now extends to the south of that town. Early North-West and HBC forts along the North Saskatchewan were collectively known as 'Forts des Prairies' and were important centres for the slaughter of buffalo and the manufacture of pemmican. Bird has presented maps from the period 1905

and 1958 to show the increase in area occupied by Parkland during that time. Early survey reports from the foothills of southwestern Alberta indicate that little tree growth was present in areas such as the Porcupine Hills in 1882-83. Now appreciable acreages of poplar and willow have cut carrying capacity of the tract and active control programs are underway on various ranches. Moss has stated that, in his opinion, the black and dark brown soils of Alberta were formed under a grass cover and trees have invaded the areas rather recently in soil history. Spot examinations in the Porcupine Hills of Alberta have shown soil profile changes from chernozemic to degraded chernozemic as willow and/or poplar invade grassland.

The invasion of trees into grassland appears to be continuing--certainly in southern Alberta, at least. Study plots have been established in an area which was farmed until 1938, was allowed to revert to a cover of timothy, Phleum pratense, and which was rapidly invaded by willow, Salix spp. Today nine separate clumps of poplar, Populus tremuloides, have become established in the area. Initial establishment appeared to have been by means of seed but more recent spread has been by root suckers. Most existing clumps of poplar in the area are surrounded by a zone in which small trees are actively invading the adjoining grassland.

Tree invasion seems to have been a factor of consequence since prairie fires were brought under control with settlement. Unless one reads the writings of early explorers, it is difficult to appreciate how extensive these fires actually were; the entire prairie area appeared to burn over at frequent intervals. A related factor has been the relative stability of climate at the perifery of the open grasslands. Coupland has shown that drought periods are much less severe at the edge of the grassy plains and these areas seldom experience the wide fluctuations in precipitation that characterize the Brown Soils zone, for example. There is much evidence to support this contention, not the least of which are PFRA payment maps of the prairies.

One must conclude, then, that invasion of tree growth is a continuing phenomenon and that it must be considered in the management of brushland pastures. The control of woody regrowth should be looked upon as simply another management problem. Methods which may be considered in the control of regrowth include:-

1) Graze on the 'heavy side of moderate' - This method is being employed as a practical regrowth control by livestock owners of the Rocky Mountain House area. It is generally recognized that, on the open grassy plains, over-use will gradually destroy the cover and replace it with useless weeds and shrubs; under-use simply results in an ever-improving cover of palatable grasses. In the Parkland, the objective is to maintain the cover at an artificially lower ecological level than the tree cover which ordinarily characterizes the area. Under-use, in these circumstances, results in rapid invasion of woody growth; over-use, through browsing, trampling, packing, etc., results in the destruction of woody growth and in a cover of grasses, notably Poa pratensis or Phleum pratense in southern Alberta. We have a lot to learn in this general area of management.

2) Work cleared land for a year before sowing the perennial crop - the possibility of seeding an annual (including an annual legume) with attendant cultivation might aid in the control of regrowth. It would probably lengthen the interval before other control measures would be necessary.

3) Chemical and/or mechanical control - the use of various herbicides, rotary cutters and the like will probably become a continuing part of management in the Parkland. In the Alberta foothills, ranchers recognize that they must spray or cut at intervals of four or five years and they have fitted this procedure into their annual operations.

4) Biological control - inasmuch as this relates to control of woody growth with grazing animals, it has no place in western Canada. We practice a "mono-husbandry", as far as our livestock are concerned, and this dependence on a single species of grazing animal negates the possibility of manipulating vegetation. In older parts of the world, where ranges are grazed by cattle, buffalo, sheep, goats, donkeys, horses, mules, camels and much vegetation is cut for fuel, all vegetation finds some use and the result is total destruction. If we had access to a wider range of grazing and browsing, animals' manipulation of even Parkland vegetation would be a distinct posibility.

CHEMICAL CONTROL OF WOODY GROWTH

H.A. Friesen, Experimental Farm, Lacombe, Alberta

The ability of the hormone-type weed killers 2, 4-D and 2, 4, 5-T to suppress or kill many species of woody plants was demonstrated in Western Canada as early as 1946. In spite of the many new compounds and formulations which have been investigated these two herbicides are being used almost exclusively today. Neither herbicide can be considered wholly adequate since some species are almost immune to high dosages while many others are only partially controlled. Wide variations in the degree of control achieved within the same species in the same general area and under rather similar conditions stresses the big gap in our basic and even our practical knowledge of the plant-herbicide factors which condition effectiveness. A brief review of some basic principles of herbicidal activity will help to better understand some of the successes and failures of herbicide usage.

To kill plants by the application of the above phenoxy herbicides three fundamental processes must take place. The chemical must be absorbed, it must be moved or translocated to the growing tissues of the plant and there produce it lethal effects.

Absorption of foilage-applied chemical requires passage through the waxy cuticle of the leaf. Since the function of this layer is to prevent the rapid loss of water from the plant it is nearly impervious to water. The cuticle is made up of cellulose and pectins, which permit the passage of water and of cutin and cutin waxes which only permit the passage of light oils. The proportions of these

ıbstances in the cuticle is determined by the age of the leaf, its genetic nature pecies) and growing conditions. Early in the season leaves of most woody plants ıve a thin cuticle penetrated rather readily by light oils. Other factors such as, rought, temperature variations, high light and lowered humidity as the season rogresses tend to develop a thicker, more impervious cuticle. Experience to ıte has shown that 2,4-D and 2,4-T esters formulated from alcohols which have ɔth water and fat solubility will result in better penetration than the water soluble 4-D and 2,4,5-T amines. These esters are the long chain or lower volatility sters such as the butoxy-ethonol and propylene glycol ether esters. The very apid penetration of the short chain esters often result in such quick and severe ıjury to the leaf tissue that further movement of the chemical is locked. xperimental work has shown that maximum penetration and translocation occur the spray solution is on the acid side. Since many ester formulations are neutral, ncouraging results from tests with the emulsifiable acids of 2,4-D and 2,4,5-T .e. emulsions of oil and free 2,4-D acid) have been reported. However, the ɔrrect kind and volume of oil to use in the formulation or to add in the field is ighly important, since quick, severe injury to the leaf cells from the improper se of oil would again prevent movement into the plant. Thus invert or water-in-il emulsions, while greatly reducing the drift hazard, must be applied very venly and at a low volume to avoid the scorching effect of excess oil. The oil oluble amines, where 2,4-D and 2,4,5-T are in an oil-phase and emulsified in ater, have been shown to be slightly superior to the water phase amines in ıboratory tests but this has not as yet been demonstrated in the field. The ɔrmulations have the advantage of greatly reduced volatility.

Translocation of 2,4-D and 2,4,5-T together with other plant foods via the ıature phloem cells is thought to be the pathway of movement in the plant. The erbicides appear to result in little immediate injury to these cells. In contrast, ıe cells which accumulate these chemicals are mostly meristematic, or young ctively dividing cells. They respond by increased water uptake, high turgor, bnormal division and growth, high respiration and eventual death. The exact ɔrm in which phenoxy compounds move in the plant is not definitely known, but is thought that they move as acids in the water phase of the plant. The big uestion remaining is why do these chemicals appear to move more readily in illows than in trembling aspen and much more readily than in balsam poplar. second question is why do these chemicals often fail to kill the buds which esult in the vigorous sprouts which often follow foliage treatment of many woody pecies, notably poplars.

What to Apply: The esters of 2,4-D and 2,4,5-T are used almost exclusively ecause of their effectiveness and relative cost. Since the vapors and/or mist aerosol) may drift for several miles it is often advisable to use the somewhat ıore costly but equally effective low volatile ester formulation such as the utoxy ethonal of propylene butyl ether ester. There have not been sufficient ests to date to establish superior kills from the low volatile esters in field con-itions in Western Canada. If the risk of injury to desirable plants is very high ıe use of the amine formulations should be considered. The 2,4-D esters are ffective on poplars, willows, chokecherry, saskatoon, western snowberry

(buckbrush), wolf willow, pin cherry and alder but not roses, raspberries, hawthorn, bearberry and dogwood. These latter species can be controlled with 2, 4, 5-T. Mixtures of 2, 4-D and 2, 4, 5, -T in the ratio of 2:1 should be used when mixed stands of the above species are to be treated. While 2, 4, 5-T will control many of the species controlled by 2, 4-D it is 3 to 4 times more costly and therefore used only where necessary. The frequent and widespread occurrence of wild roses in parkland and mixed prairie range lands requires use of the mixture of the chemical. This mixture is usually referred to as "brushkill".

Experimental work, mostly in Eastern Canada has shown that the addition of CBM (sodium chlorate 30% + sodium borate 68% mixture) at 10 pounds per acre to the above herbicide solutions will give increased brushkill.

Other herbicides such as fenac, silvex, fenuron, 2, 3, 6-TBA, and ammonium sulphamate have proven generally unsatisfactory for one or more of the following reasons viz: efficacy, costs and undesirable effects on desirable vegetation. A promising new compound, particularly of roses and raspberries is Tordon (picolinilic acid).

When to Apply: The esters of 2, 4-D and 2, 4, 5-T alone or mixed may be applied as:

1) Foliage spraying is best done as soon as the leaves are fully expanded. Although there is a lack of well documented evidence from actual field trials, spraying in the morning when stomata are open should be superior to late afternoon or evening. Full coverage of the leaf should be superior to droplet application if drying time is not a factor. Surfactants improve wetting and thereby coverage. However, if combined with excessive temperatures and low humidity this could be detrimental because of the rapid drying of the thin layer of solution and therefore the cessation of herbicide absorption. It should be stressed that warm temperatures 70-80°F enhance absorption and translocation and are preferable to lower or higher temperatures.

Treatment	Rate lb/A	Date of spray - % kill poplar		
		June 13*	July 20	Aug. 21
2, 4-D	1	80	55	40
2, 4-D	2	90	65	55
2, 4-D. 2, 4, 5-T(1:1)	1	75	60	40
"	2	85	65	60

x - Not mowed in 1961 prior to spray.

2) Dormant, over-all spraying may be done at any time during the absence of leaves. Extension of the spraying season into the winter months is the big advantage gained by the use of this method.

3) Basal-bark and stump treatment can be carried out at all seasons.

How to apply: The general recommendation for 2,4-D, 2,4,5-T and 1:1 or 2:1 mixtures of these chemicals is 1 to 2 pounds per acre total acid equivalent to control the brush species and very young poplars mentioned earlier. Taller, more mature tree growth will require higher rates i.e. 2 to 4 pounds total acid equivalent per acre. Thorough and complete coverage with the spray solution appears essential for effective control, particularly when foliage spraying is being done. Close high-pressure spraying of the fog or mist type usually will give the more complete coverage of both sides of the leaves. Height and density of the foliage will directly effect the volume of spray solution required for coverage. The increased penetration of the oil-water emulsions will permit substantial reductions in the volume of spray carrier. A better appreciation might be gained by citing actual examples of woody growth control under field conditions.

a) Conventional field sprayer. Wolf willow, willows, western snowberry, wild roses and chokecherry are the major woody species invading the open mixed prairie and the very sandy soils of the parkland areas. Where these species do not exceed 3 to 4 feet in height conventional field sprayers can be adapted for use by elevating the booms and using nozzles capable of applying 15 gallons per acre or more of spray solution. A mixture of 1.5 pounds of 2,4-D ester in 15 gallons per acre of water sprayed on the foliage would result in complete defoliation of all but the roses at a cost of $2.00 to $2.50 per acre. Retreatment in the following year usually will be necessary to kill resprouts. If spraying is done before the snowberry patches become too dense the native grasses will recover quickly. In old established and very dense snowberry patches most of the grass will have been crowded out and reseeding would be advisable. Because the topography and terrain are usually quite rough and such taller growing species as wolf willow, willow, chokecherry and saskatoon are often part of the vegetation to be sprayed, boomed sprayers have found only limited usage. Better coverage and kills are obtained by use of turbine sprayers or aircraft. This treatment would also give a good measure of control of pasture sage, frequently found in association with the above. Other pasture forbs which will be at least partially controlled by 2 pounds per acre of 2,4-D ester are such poisonous weeds as arrowgrass, death camas, larkspurs, lupines, water hemlock, locoweeds and St. Johns-Wort; non-poisonous weeds completely controlled are gumweed and goatsbeard while top growth control of Canada thistle, knapweeds, leafy spurge, hoary cress and toadflax will be realized. It should be kept in mind that susceptible desirable forbs will also be destroyed, such as vetches, pea vines and others.

b) A turbine sprayer applying the same dosage of 2,4-D in 8-10 gallons per acre of water would give better coverage of these species including those up to 10 feet tall. Better kills from treatments made later in the season would usually result from the better coverage. Cost would be slightly higher because of the higher initial equipment cost.

Other possible adaptations of the field sprayer are the broad jet or cluster-nozzles in lieu of the boom. These permit the treatment of taller growth but required the use of 30 or more gallons per acre of water and often give less uniform spray coverage.

c) Aircraft spraying, using both fixed-wing and helicopter has been widely tested and used in the U.S.A.; considerable work with the fixed-wing aircraft has been done in Canada. Foliage spraying of the type just described for ground equipment could be as effectively and much more quickly carried out with aircraft using the same dosage of 2,4-D and a total spray volume of 3 to 5 gallons per acre of oil-water emulsion as the carrier. Emulsions containing 1 part of oil to 2 to 4 parts of water are considered more satisfactory than oil alone. Fuel oil is the most commonly used type of oil. Aircraft apply the herbicide in swaths 40 to 50 feet wide. The risk of drift is high and every precaution to avoid injury to neighboring desirable plants or crops should be taken. Air spray costs for this operation would be in the area of $4.00 per acre depending on the acreage to be sprayed, uniformity and height of the woody growth, distance from landing area and uniformity of topography, thereby requiring fewer flagmen. Helicopter costs in the U.S. run about $1.00 per acre higher than fixed-wing.

1. Tall, nearly mature or mature stands of aspen and poplar trees can be killed by repeated foliage spraying of 2,4-D esters. Because of the size of the trees and the rather dense leaf canopy frequently encountered good coverage by the spray solution is often difficult to attain. Uneven coverage the seeming difficulty of herbicide movement in these trees appear to be responsible for the incomplete kills frequently realized. Trees of this size usually require retreatment since many of the dormant buds in the root collar survive a single foliage treatment. The dosage of 2,4-D should be 3 pounds per acre or higher and where the stand is close the volume of oil-water carrier should be at least 10 gallons per acre. Again, because of the size of the trees, application is best made from the air. Costs of such application vary between $6.00 and $8.00 per acre depending on local conditions listed in the previous section. Because of cost, the need for repeated sprayings and the mass of standing deadwood which deters natural grass recovery as well as grazing animals this method has limited practical application in the reclaiming of land for grazing or cropping purposes. There has been no significant advantage shown in favor of 2,4,5-T over the much cheaper 2,4-D for the control of aspens and poplars.

2. Dormant over-all sprays of brush and trees have been tested at a number of sites in Western Canada with apparent equal success to foliage spraying. Manitoba Hydro has used this method extensively since 1950 on some 25,000 miles of power lines. Turbine sprayers applying 3 pounds of 2,4-D: 2,4,5-T mixture (1:1) in 20 gallons per acre of diesel fuel. A spray mixture of 2 pounds of 2,4-D:2,4,5-T mixture in 10 gallons of fuel oil per acre have given nearly equal results. The average time between treatments has been 4 to 5 years. Spraying operations are made throughout the winter, whenever temperatures are not too severe. There have been insufficient tests to date to establish that spraying as above in the dormant season would be safe for legume forages.

3. Basal bark treatment of trees consists of applying 2,4-D ester or 2,4-D: 2,4,5-T mixture (esters) in an oil carrier. A mixture of 1.5 pounds total acid in 10 gallons of oil is painted on the bark from a height of 2 feet to the ground line; the protruding roots should also be covered. A hand or hand directed machine sprayer can be used in place of the brush. The trunk and protruding roots should be wetted to the point of run-off. Stumps may be treated in a similar way.

Basal bark treatment by means of a tree injector using the above herbicide ixture will yield similar results. This implement consists of 1 1/2-3 inch metal linder, about 4 feet long, fitted with an incision blade and valve mechanism for lease of the solution into the incision. Incisions should be made at intervals of to 4 inches apart completely around the trunk base. Sufficient chemical to soak e incision without excess runoff should be applied.

Each of these methods are slow and require much hand labor, which makes em too slow and costly for large scale use. The cost of each per tree (6 to 8 ch diameter) would range from 2 to 5 cents.

ombined Herbicides and Mechanical Treatments

Herbicides used in combination with mechanical methods permit a better nge and pasture improvement program. At our Metiskow project farm, a dense and of wolf willow about 8 feet tall was killed by 1 1/2 pounds of 2,4-D ester in 960, the deadwood was removed by rotary mowing in the spring of 1961. No rther treatment has been required to date. The area has averaged 600 pounds dry matter (native grasses) per acre while prior to 1961 it was inaccessable livestock. The average yield for the 1961-63 period was influenced by above erage rainfall in the last two seasons, the soil is very sandy (stabalized dune nd) and long term yields of native grasses would probably be nearer to 400 pounds r acre. Cost of this reclamation has been $2.25 for spray and $3.50 for rotary owing for a total of $5.75 per acre.

Where mechanical methods to remove mature willows, aspen and poplars ust be resorted to, herbicides (primarily 2,4-D ester) have proven effective d economical for the killing of resprouts. In our west-central Alberta tests 2 unds of 2,4-D ester per acre as a foliage spray or applied in 10 gallons per re of fuel oil as a dormant spray have given good control of emerged and tively growing poplar sprouts but has not completely prevented further sprout-g. One spray treatment and rotary mowing in the following year have resulted good control since 1960. Alsike and red clovers were not visibly injured by raying of the dormant sapling as in early November. Where foliage treatments e to be used severe injury to the seeded legumes would result.

ther chemicals:

1) Fenac - costly but effective on deep rooted perennials such as Canada istle, toadflax and leafy spurge. At the suggested 10 pounds per acre the cost about $50.00. Mixtures of fenac and 2,4-D appear equally effective and less stly. Not effective in poplars, roses and snowberry.

2) Silvex - rather similar in affect to 2,4,5-T but considerably higher in ice.

3) Fenuron pellets at about 50 pounds per acre give good kill of poplars but st and application difficulties limits their use to spot treatments or along fence ws.

4) Tordon (picolinic acid) appear very promising in early trials as foliage sprays particularly against roses. Also good on other brush species. Pelleted formulations appear highly effective against mature poplars.

Expected Returns

The returns from brush killing with herbicides without regrassing will natura vary with local weather, soil and the dominant grass species present. In good mixe prairie as found in Brown soil zones and in the drier parts of black soil zones the native grasses freed of competition yield an average of 400 pounds of dry matter per acre. Under strong competition from western snowberry and wolf willow the grass is not only greatly suppressed but is also largely inaccessible to livestock. Consequently the yield must be considered as virtually nil. Young or more open stands of these species do not appear to suppress the grass appreciably, this may be due to cattle showing a preference to graze the uninfested areas and the beneficial effect of additional snow trapped during the winter. Corns has concluded that the failure to obtain yield increases from the chemical killing and rotary mowing of relatively short open stands of wolf willow on sandy shallow black soil at Kinsella Alta was due to the grass roots feeding nearer the surface. In view of the extremely depressing effect on the grass of the older, denser stands of these and other woody species the early killing is desirable and rather is essential to continued grass production.

In the moister parts of the Black soil zone and along the foothills (fescue prairie) the average yields are considerably higher, 800 to 1000 pounds dry matter per acre. McIvor at Indian Head controlled wolf willow, western snowberry and poplar with 2 pounds per acre of 2, 4-D ester. The untreated native grass on this shallow black soil at Kelliher Sask. yielded about 300 pounds whereas the treated yielded about 900 pounds per acre. Seeding brome-alfalfa mixture into the sod (no previous tillage) increased the yield by a further 400 pounds per acre. These yields are similar to those reported for native pasture (cleared only, not reseeded) by PFRA in Saskatchewan and from tests west of Lacombe, Alta. The low yield of the native as compared with the cultivated forage species in the parkland areas would the advisability of reseeding those areas where the native species have been largely crowded out by woody growth, provided that the topography and other features are suitable.

RESPONSE OF NATIVE AND INTRODUCED SPECIES TO GRAZING IN WOODED AREAS

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Our interest in pasture and wooded areas dates back to 1948 when some preliminary surveys were made in the northern fringe of settlement in Saskatchewan for the purpose of advising the Provincial Government whether or not to go ahead with the development of certain areas for pasture production. In 1957 studies were started to obtain data concerning the response of various seeded and native forage

species to the effects of grazing. These studies did not become intensive until the summer of 1963 when detailed studies were made throughout a three-month period in the Cookson, Barrier Lake, Marean Lake, Lizzard Lake, and Erwood Community Pastures of the Saskatchewan Department of Agriculture and the Beaver Hills Community Pasture of the P.F.R.A.

These studies are being made in land capable of supporting aspen forest. Comparisons are being made between grazed and ungrazed habitats in forest that has not yet been cleared, in land that has been cleared but not improved by seeding, and in land that has been cleared, plowed and seeded. Comparisons are obtained by careful selection of paired sites inside and outside boundary fences and inside and outside exclosures that had been erected for this purpose.

From these studies some preliminary generalizations can be made, as follows:

1. Some introduced species of grasses can be maintained in dense stand under heavy grazing. The most resistant grasses that have so far been tried are brome grass and creeping red fescue. These grasses maintain a denser stand under grazing than under protection from grazing. This stand will remain dense for at least seven years, and there is no indication that it will become less dense with greater age. No measurement has been made of productivity under grazing. Several other forage species, particularly timothy and alfalfa, that have been seeded do not withstand heavy grazing.
2. Among the native grasses which withstand grazing to the highest degree are Kentucky blue grass and certain wheat grasses (slender wheat grass and bearded wheat grass). These grasses maintain a denser sward under grazing than under protection from grazing. No measurement of their productivity has been made. In certain lowland habitats fowl meadow grass will withstand and increase under heavy grazing. Many other native grasses of upland forest and of meadow do not withstand even moderate use.
3. Under heavy grazing regrowth of aspen is severely curtailed. It seems practical to consider this as a means of controlling regrowth. However, black poplar is not checked in this way.

The concept of the rate of grazing of these wooded pastures will have to be quite different from that of the open grassland areas. It is possible that a higher intensity of grazing will be necessary to maintain the desirable vegetation condition of both seeded and native pasture areas in the forest environment.

MECHANICAL AND CHEMICAL CONTROL OF SILVERBERRY (WOLF WILLOW) (ELAEAGNUS COMMUTATA) ON NATIVE GRASSLAND

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University of Alberta

A research project on control of silverberry on rangeland at Kinsella, Alberta, was begun in 1960 and carried on for three years. The shrubs in the experimental area were two to three feet tall, in a population of about 70 plants per square rod.

Exploratory trials included comparisons of amitrol T, dalapon, dicamba, esters of silvex, 2,4-D, 2,4,5-T, MCPA, at 1 1/2 and 3 lb/A, in 25 gal water/A, and barban and avadex at 3 and 10 lb/A. Of these chemicals, 2,4-D, 2,4,5-T, MCPA, silvex and dicamba were equally, and highly effective but dicamba was slower in producing visible effects. The other chemicals were ineffective at the rates used.

Subsequent experiments emphasized 2,4-D because of its efficiency and relative economy. Single and repeated applications of the herbicide were made in different seasons and in combination with mowing of the silverberry at times before or after chemical treatments.

The following observations were based on records of numbers of root suckers and of re-sprouts on old branches. Mowing in late August 1960, induced abundant new growth from the root system during the following two years.

Late summer treatments with either 1.5 or 3 lb 2,4-D/A in 1960, were superior to mowing and were essentially equal to one another with regard to top-killing and extent of regrowth during the following two years.

Single, early-summer-treatments in 1961 with rates of 2,4-D of 1 to 4 lb/A were more effective than late summer treatments in 1960 and were just as effective alone as when preceded by mowing or 2,4-D treatment during the previous August. Mowing as many as three times was less effective than a single application of 1 lb 2,4-D/A in early summer. Mowing after 2,4-D treatment had no added effects.

The lowest rate of 2,4-D used in early summer was as effective as the highest in killing all top-growth. There were however a few new suckers per plot during the following year. Repeated treatments with rates of 2,4-D from 1 to 4 lb/A inclusive, applied to intact plants in June and to the limited regrowth in August of the same year were no more effective than single early summer treatments.

The most successful were 2,4-D applications of 1 to 4 lb/A in early summer followed by comparable repeated application to regrowth present in August of the following year. Two treatments of 1 lb/A were as effective as two 4 lb/A applications. They permitted an average of less than 1 sucker per square rod plot to appear during the year after the second spraying. Mixtures of 2,4-D at 2 lb/A with sodium chlorate, or ammate at 2 and 5 lb/A; or with maleic hydrazide or CCC at 0.5 and 2 lb/A were no more effective than 2,4-D alone in suppressing new growth from roots of treated plants.

Even the most effective treatments resulted in no statistically significant improvement in the very variable grass yields in these fairly open stands of silverberry. There seems to be little doubt however that improved availability of the grass to livestock, together with prevention of multiplication of silverberry population would, with proper grazing management, be beneficial in the long run.

RESEARCH AND DEVELOPMENT OF NORTHERN PASTURES IN RECENT YEARS

Chairman - W.N. MacNaughton, Experimental Farm, Melfort

Introduction

Considerable information based on experience is presently available on different methods of removing tree growth and establishing a cover of grass - that is getting land into pasture production. However, there appears to be much less information available on the management of the pasture, once established, so as to maximize productivity. This involves prevention of tree regrowth, animal management, fertilizer applications, intensity of grazing, etc.

PROGRESS REPORT OF PASTURE RESEARCH IN THE GARRICK COMMUNITY PASTURE 1962 - 1963

D.A. Cooke, Experimental Farm, Melfort

The experimental site is situated on the SW 1/4, Sec. 5 of the Garrick Community Pasture located in Twps. 53 and 54, Ranges 16 and 17, W2M. The area was cleared in February, 1961 and the woody debris was piled into windrows approximately 10 rods apart. Breaking was done by the Saskatchewan Conservation and Development Branch by means of D8 caterpillars pulling two 12' Rome breaking plows in tandem. The area was then worked with a 19' Rome plow equipped with 24" blades and immediately packed by means of large steel drums weighted with water. A 28 run double disc drill was used to seed the following mixture: bromegrass (6), crested wheatgrass (3), creeping red fescue (2), Russian wild rye (1), Rambler alfalfa (1), white Dutch clover (1/2). Dry conditions delayed germination and growth but adequate stands appeared to have been established by the end of the 1962 growing season. The topography is undulating and glacial stones and boulder outcrops were frequently encountered throughout the area. The soil is light loam in texture, having an "A" horizon of undecomposed organic matter, a very shallow, light gray "B" and a "C" horizon of gritty material with stones of various sizes.

Objectives:

The objectives of this study are: (a) to determine the type and amount of vegetation that has occurred in the area as a result of the various cultural treatments employed to bring the pasture into production; (b) to determine the effect of grazing on yield and persistence of herbage species and on regrowth of wood species; (c) to determine the effect of herbicides, mowing and fertilizer on pasture yield and control of woody regrowth; (d) to estimate carrying capacity and degree of utilization from year to year; (e) to determine the effect of 2,4-D and 2,4,5-T on woody regrowth when applied during the winter; (f) to determine the effect of butyric and other herbicides on the control of woody regrowth and survival of legumes; (g) to study the natural plant succession following clearing and breaking.

Procedure:

Two separate areas, 135' x 800', were each divided into seven strips of 15' x 800' and one strip of 30' x 800'. Each 15' x 800' strip was sub-divided into 100' blocks. A permanent 20' x 15' quadrat was located within each block. The number and height of each woody species was determined per quadrat. The basal ground cover provided by the non-woody species within each quadrat was determined by means of the point method by using a 36-inch fram carrying 18 points spaced 2 inches apart. A total of 288 points were examined per quadrat. Two permanent transects, each 200 feet long, were located within the 30' x 800' strip. A count of woody species along the transect was recorded and the basal ground cover for the herbage species was determined by placing the point frame to bisect the transect at right angles at one foot intervals. An enclosure was erected to protect half of the quadrats and 100 feet of each transect from grazing.

On July 17, 1962, the seven 15' x 800' strips at both locations received one of the following treatments:

1. Check
2. Fertilized - 200 pounds ammonium nitrate (33.5-0-0) per acre.
3. Fertilized - 250 pounds ammonium phosphate (27-14-0) per acre.
4. 2,4-D - 10 ounces per acre.
5. 2,4-D - 20 ounces per acre.
6. 2,4-D - 30 ounces per acre.
7. Mowed - 3 inches in height.

One half of each check and fertilized strip received an application of 200 pounds of gypsum per acre. Each strip was sampled on September 25 in 1962 and on July 9 and October 9 in 1963.

Results and Discussion:

A list of the cultivated and native species found in the experimental area and an indication of their importance in terms of percentage basal ground cover was compiled. The cultivated species accounted for slightly more than half the total ground cover in 1962 but made up over ninety percent of the existing cover by the fall of 1963. Crested wheatgrass was by far the most important grass followed by bromegrass and creeping red fescue. Russian wild rye failed to establish. Six species of native grasses were identified but as a group were of little importance. This may change, however, especially with respect to Poa. These results lend weight to the argument that the use of such seeding mixtures is an undesirable practice. Utilization of the crested wheatgrass was poor while the bromegrass and early alfalfa growth were severely overgrazed. The creeping red fescue and white Dutch clover established poorly and contributed little to the stand. By mid-summer the crested wheatgrass had matured and was almost completely neglected. Regrowth was almost pure alfalfa which tended to aggravate the bloat problem.

The severity of regeneration of woody species is indicated by the fact that ıe area is populated by the equivalent of one woody plant per four square feet. opulus, Rosa and Salix species made up 96 percent of the population although a ɔtal of eleven species were present in the area. As might be expected poplar nd rose were the most abundant.

The effect of fertilizer, 2,4-D and mowing on yield of dry matter for 1962 nd 1963 is presented in Table I.

. Production of dry matter per acre increased from 540 lb/a in 1962 to 3865 lb/a in 1963.
. Alfalfa accounted for 17 percent of total production in 1962 and 46 percent during 1963.
. Production was slightly higher on the mowed strip than on the check strip in 1963 due mainly to the large increase in legume.
. Fertilizer doubled forage production in 1962 and increased production by 2417 lb/a in 1963.
. The major response to added fertility was obtained from the grass portion of the sward. The legume fraction remained relatively constant. Since gypsum had no effect it is assumed that sulphur is not a limiting factor in these soils.
The 2,4-D application eliminated the top growth of alfalfa and weeds in 1962. Very little legume recovery or re-establishment occurred in 1963 and yield of dry matter was reduced by over 1/2 tons per acre.

Table 2 shows the effect of fertilizer, 2,4-D and mowing on the per- stence and growth of woody species.

Considering the fact that the 2,4-D was not applied until July 17 of 1962 surprisingly good control was obtained at the 20 and 30 oz. rates. It may be suggested that, with the exception of rose, new regrowth (up to 24 inches in height) can be effectively controlled with 2,4-D at rates of 20 to 30 oz. per acre providing application is made when the regrowth is just coming into full leaf. Regrowth over 24 inches in height appeared to be considerably more resistant.
Grazing pressure was relatively light in 1963 and consequently browse was confined to trembling aspen.
Fertilizer increased the competi tiveness of the grass and thereby prevented the initiation of new woody regrowth. However, the regrowth that had been established prior to fertilization was stimulated by the improved fertility.

Table 1. EFFECT OF FERTILIZER, 2,4-D AND MOWING ON YIELD OF DRY MATTER
GARRICK COMMUNITY PASTURE - 1962-1963

	Year	Check	Mowed 1962	Fertilizer		2,4-D Sprayed 1962		
				60# N	60# N 30# P_2O_5	10 oz.	20 oz.	30 oz.
		lb/a	lb/a	lb/a	lb/a	lb/a	lb/a	lb/a
Total Yield	1962	540	373	920	1139	462	385	354
	1963	3865	4133	5670	6895	2827	2105	2515
Grass	1962	416	271	703	972	462	385	354
	1963	1661	1423	3344	4662	2272	1733	2304
Alfalfa	1962	94	85	188	139	0	0	0
	1963	1805	2293	1885	1860	143	34	13
Forbs	1962	30	17	29	28	0	0	0
	1963	399	417	441	373	412	338	198

D.A. Cooke

Table 2. EFFECT OF FERTILIZER, 2,4-D AND MOWING ON THE PERSISTENCE AND GROWTH OF WOODY SPECIES GARRICK COMMUNITY PASTURE - 1962-1963

Treatment	[1] Class	trembling aspen				balsam poplar				willow				alder				rose			
		Exclosure		Outfield		Exclosure		Outfield		Exclosure		Outfield		Exclosure		Outfield		Exclosure		Outfield	
		1962	1963	1962	1963	1962	1963	1962	1963	1962	1963	1962	1963	1962	1963	1962	1963	1962	1963	1962	1963
Check	1	98	84	102	31	113	73	63	41	18	14	5	6	14	5	2	11	108	201	107	134
	2	28	40	42	60	18	58	6	63	7	10	6	5	0	2	2	2	0	0	1	0
	3	1	3	2	8	0	2	1	4	0	0	0	1	0	0	0	0	0	0	0	0
Mowed	1	79	80	97	37	103	82	65	52	13	22	7	20	4	4	3	0	54	126	239	334
	2	26	9	20	10	30	17	16	16	9	0	6	1	1	0	0	0	0	0	3	0
	3	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0
60# N	1	97	66	92	28	97	40	39	15	17	11	4	8	5	2	2	2	74	68	154	178
	2	56	74	45	53	34	72	0	25	8	12	7	5	0	0	4	4	0	2	7	0
	3	2	8	0	4	0	4	0	2	0	2	0	0	0	0	0	0	0	0	0	0
60# N + 30#P_2O_5	1	11	9	127	56	64	29	64	29	20	14	12	14	8	3	7	5	53	54	116	114
	2	2	2	51	39	1	25	7	28	10	12	13	9	0	2	0	2	0	0	5	1
	3	3	0	0	10	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0
2,4-D - 10 oz.	1	64	21	165	19	90	55	58	28	36	32	6	5	4	0	9	3	77	181	157	75
	2	8	9	56	43	12	21	16	18	17	7	5	2	0	0	0	0	1	0	0	0
	3	0	0	1	7	0	0	0	6	0	1	0	0	0	0	0	0	0	0	0	0
2,4-D - 20 oz.	1	30	10	92	7	68	54	43	9	41	38	25	10	2	0	1	0	57	127	58	78
	2	7	5	17	6	9	9	1	2	20	6	16	5	0	0	0	0	0	0	0	0
	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2,4-D - 30 oz.	1	23	11	96	3	55	20	65	3	27	12	36	2	3	0	6	0	15	24	78	126
	2	4	3	45	10	3	2	6	3	14	2	12	0	0	0	0	0	0	0	2	0
	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

[1] Class : height in inches

1 0 - 24

2 24 - 48

3 48 - 72

Research and Development of Northern Pastures in Recent Years

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Experimental Farm, Beaverlodge, Alta.

Before discussing the most recent research in pasture development in the Peace River region, we will consider research that was done in the period 1950-5 which has some bearing on this topic. Early work initiated by Carder and followed up by Martiniuk, indicated that seeding forage crops on undisturbed land under poplar cover was largely unsuccessful. An exception to this in recent years has been the seeding of small seeded crops such as timothy and alsike by ranchers along trials and around water holes. This has been partially successful partly due to the fact that there is less competition on these sites and to the fact that these seeds have been covered to some extent by the trampling of cattle.

In 1950, 1,000,000 acres in the Peace River region were ravaged by fire. A concentrated research program was undertaken to determine the feasibility of regrassing these burned-over areas. Several species of grasses and legumes were seeded both in the fall and spring following the burn at several locations. It was found that abundant forage for pasture purposes could be produced on these burned-over areas. It was also indicated that better results were obtained when seedings were made in the early spring following the fire, rather than in the late fall. Pure stands of grasses showed signs of nitrogen deficiency when seeded on burned-over soils low in organic matter. This was corrected where legumes were grown in association with the grasses. A practical demonstration of this research was the successful aerial seeding of a burn on the Sunset Community Pasture (west of Dawson Creek, B.C.) in the spring of 1962.

Another trial, although not directly related to the production of pasture on new land, gives an indication of the productivity of a depleted soil after 25 years of annual cropping. The unfertilized bromegrass-alfalfa pasture produced 165 lbs. of lamb per acre and as high as 273 lbs. of lamb with fertilizer.

Recent Research

With the beef cattle population increasing, there has developed a greater demand for pasture in the Peace River region. Research was initiated in 1959 at Demmitt, Alberta on a Grey Wooded clay loam of the Hazelmere-Demmitt series to investigate pasture establishment with a minimum of tillage and expense. The tree cover on this area was mostly heavy, dense aspen poplar. This cover was removed using a V-type brush cutter and piler in the fall of 1958. While different establishment methods were attempted on this area the work indicated that shallow double discing (to 3 in.) with a heavy serrated disc, floating, broadcast seeding and floating again resulted in a production of 2836 lb. of dry matter in the first production year. This was made up of 12% alfalfa; 55% bromegrass; 14% creeping red fescue; 11% weeds (largely edible forbs) and 8% poplar regrowth. The following year (1961) the production amounted to 5469 lb. of dry matter composed of 29% alfalfa; 26% bromegrass; 20% creeping red fescue; 15% weeds; and 10% poplar regrowth. This area still yielded 4521 lb. of D.M. in 1963.

A more detailed study was undertaken on the community pasture south of roundbirch B.C. on a Grey Wooded sandy loam of the Beryl series in 1961 and t Demmitt in 1962. Here several disc treatments were compared to moldboard lowing. The best combination of good pasture establishment, low cost and re-rowth control, was obtained using a heavy serrated disc at a depth of 3-4 in. llowed by floating, broadcast seeding and floating. However, the following year 962) at Groundbirch there was no significant difference in yield of seeded species mong tillage treatments (Table 1).

Table 1 1961 Establishment and 1962 Yield Data. Groundbirch, B.C.

illage treatment	Tillage depth, in.	No. of passages with breaking equipment	Approx. total cost of tillage operation $/A	Seeded species per * sq. yd	Poplar & willow plants per sq. yd	D.M. Cwt/A 1962
oldboard plow-uble disced; oated	6-7	1	17.00	104	0.7	6.48
ome disc (8 ft ngle gang, oated)	7-8	2	7.00	131	2.0	8.37
ome disc "	3-4	2	5.50	144	2.0	8.25
ome disc "	2-3	2	4.50	107	4.0	7.11
ndem disc rrow, smooth scs	0-1	6	12.00	136	4.0	5.44
fset disc, nooth discs	1-2	4	12.00	136	4.7	8.43

* Pasture mixture consisted of

Bromegrass	5 lbs.
C.R. Fescue	3 lbs.
Crested wheatgrass	3 lbs.
Alfalfa	3 lbs.

Yields were low on this soil, the first production year, partly due to the t that rabbits ate off all the spring growth prior to placing of cages about May . While early work at Demmitt indicated that the best results were obtained en seeding was made prior to discing, this did not hold true in the more detailed dies at Groundbirch and Demmitt. Also, at both locations the broadcasting of seed was superior to drilling.

Regrowth

Regrowth continues to be the main unsolved problem in pasture development on new land. Tests conducted to date using herbicides during dormancy, with some snow cover on the ground to protect the legume component in the pasture, have been unsuccessful. The rotary brush mower at present appears to be the only practical control method other than sheep. On the area initially seeded at Demmitt in 1959 the brush grew to about 4 feet in 1961. The brush mower was used in early August of 1961 and should not be required again until early 1965.

While there is considerably less regrowth when the moldboard plow is used, it has the disadvantages of higher cost and forage establishment problems on the heavier textured Grey Wooded soils.

The first year yields (1963) of the intensive trials at Demmitt were low at approximately 10.00 cwt./ac. The severe drought of 1963 markedly influenced forage production on the new seedings. In the same test, uncultivated areas not seeded to forage produced 4.1 cwt. of dry matter, approximately 40% of which was native grass.

In 1963, trials were laid out at Groundbirch using the rotovator to incorporate fertilizer and seed into the top 2 inches of soil. Establishment, was excellent in spite of severe drought.

Other fertility trials, where the fertilizer was broadcast on established stands, gave no results since there was not sufficient moisture to dissolve the fertilizer. These consisted of factorial treatment arrangements of 0, 30, and 60 lb. rates of nitrogen and phosphorous applied in April. These trials were repeated at Demmitt and Groundbirch last fall.

Ball & Chain

The P.F.R.A. ball and chain was used in the Peace River region in the winter of 1962-63 in cooperation with the B.C. Forest Service. On light to medium cover (Type 1 and 2) two D7D's of 112 H.P. or on C2U-D8 of 130 H.P. and one D7D did not have sufficient power or traction to do the job at a reasonable cost. i.e. between $2-3.00 per acre. However, when two D9-18A's of 260 H.P. were used in heavy and extra heavy (Type 3 and 4) there were great savings in cost over the conventional clearing methods.

From the experience gained using the ball and chain the minimum power available to clear the tree cover, typical of the Peace River region, should be crawlers of 180 H.P. in excellent condition and having a grouser height of 2 inches. When heavy and extra heavy cover is to be removed the power available should be over 230 H.P.

However, there are large areas in the Peace River region that have been burnt-over and the present cover is not suitable for removal with the ball and chain.

1964

Plans call for testing the new hardy variety of birdsfoot trefoil called Leo. There are several Grey Wooded soils on which pasture development will take place that are a little too acid for alfalfa to give its full potential and at the same time are too dry for alsike to produce much forage. Leo may have a place here.

DEVELOPMENT OF NORTHERN BUSHLAND PASTURES IN WESTERN CANADA

Chairman, A.A. Guitard,
Experimental Farm, Beaverlodge

Introduction

On Janurary 9, 1964 the Peace River Branch of the Alberta and B.C. Institutes of Agrologists convened a 2-day meeting of virtually all professional people concerned with agriculture in the north to consider the "Agricultural Potential of Northwestern Canada".

During this meeting it was established that there is now known to exist in northern Alberta within the legally surveyed areas at least 7.5 million acres of land that can be readily developed and cultivated for agricultural purposes. Approximately 2.2 million acres of this is now being cultivated. Further, there exists outside of the area of legal survey in northern Alberta another 7.5 million acres that are equally arable and a further 15 million acres that, with removal of the trees and the establishment of forage species, could be suitable for the production of pasture and hay. Thus, there are now known to exist in northern Alberta some 30 million acres of land that can be used for agricultural production. Only slightly in excess of 2 million acres are now developed for this purpose.

The symposium also established the fact that there exists in northern British Columbia at least a further 2.5 million acres of arable land, in the Yukon Territories 0.5 million and in the Northwest Territories 4.5 million acres. These areas, at the present time totally undeveloped, are believed to be fully arable insofar as soil and climate are concerned. As more extensive survey is undertaken in these more remote areas, further tracts of arable land and land suitable for supplementary production will be found.

There are also in northern Saskatchewan and Manitoba large areas of land that can be put to agricultural use. The total acreage and the rate at which these lands are being converted from bush to cultivated fields are rather staggering. In the Peace River region alone approximately 250,000 acres are now being converted from bushland to cultivated fields annually.

We are not here to discuss all aspects of this conversion, but only the problems associated with the development of northern bushland pastures. We will now discuss the problems that the four western provinces have encountered in this development. From these we will attempt to determine the major problems that will be associated with future development and the areas in which research must be undertaken in order to solve these problems before they become of sufficient magnitude to hinder the normal development of this natural resource.

PROBLEMS ENCOUNTERED IN PASTURE DEVELOPMENT

A.A. Watkins, Man. Dept. Agric.

Pasture development in Manitoba, exclusive of P.F.R.A. operated community pastures, has been confined to demonstration bush clearing projects, forage crop variety test plots and fertilizer trials. The projects have been conducted on a wide range of soil types including low productivity and sub-marginal lands throughout the province. Recent emphasis on the desirability for increased livestock production has tended to focus attention upon the Interlake region of Manitoba to determine the extent of its potential as a livestock producing area. This is an extensive area and although sizeable pockets of quite productive soils do exist within the area, the major portion is considered marginal for cereal crop production.

The topography is level to slightly undulating with much of the area displaying low ridge and swale formation or pattern in a north-west to south-east direction.

The swales are subject to varying degrees of flooding and the stony ridges covered with bush limit the pasture opportunity under natural conditions. Even under cleared conditions the topography presents difficulties whenever cropping practices are attempted.

The bush cover is predominantly aspen poplar with some oak in the southern portion and spruce in the north. The soils of the Interlake of Manitoba are unique relative to other regions of western Canada. The thin glacial till soil over most of the area is high in lime content -stony and often imperfectly to poorly drained. There are areas of salinity, peat, semi marsh and marsh lands throughout the area. In other places the underlying limestone is covered only by a few inches of drift material and often outcrops which results in droughty pasture conditions during the summer grazing period.

Cultivation of these lands for cereal crop production is difficult and expensive. It has been estimated that soils of low productivity comprise around 65 percent of the total area, approximately 2 1/4 million acres.

While most farmers in the area now realize that the final use of this land is for hay or pasture, they still tend to think that a few crops of oats are necessary.

There is a definite reluctance on the part of most farmers to improve bush-land specifically for pasture. The fact that livestock is the main source of income on the farm - the fact that the eventual goal will be livestock, does not matter. The farmer will tell you he needs a couple of good grain crops to recover his land improvement investment before he turns it into forage or pasture.

The capital requirements needed to clear land often exceed the financial resources of the farmer. This area has a long history of farmers owning a quarter or two with very little lease land to supplement. Thus the farming unit has not been of sufficient economic size to permit a reasonable return to the farmer. Small unit size, coupled with land of low value, has meant low incomes generally for the bulk of the people. As a result, local development capital is usually not available. The trend in the area is now to larger units which will permit a much wider base of operation.

Large acreages are held by the crown, local government districts and municipalities throughout the area and are available for leasing. In the past, largely because of lack of pressure for lease land, it has been customary for farmers to lease additional land at previously low rental rates rather than carry out development of bushlands close to home. The rental rates were considerably less than taxes and investment costs under private ownership. This in effect encouraged an extensive rather than an intensive land use pattern. In recent years the pressure for lease land has increased so that there is now less opportunity for farmers or ranchers to expand by picking up lease land. Therefore there is increasing interest and demand for information on bush clearing to permit the farmers to increase their production.

The information we have derived from projects in the area to date, while providing some answers, does not go far enough. The recommended application of methods and techniques used in other farming areas may not be applicable to the Interlake area. He knows, on the basis of crop production records what his expected grain yield return will be - he does not however, have a comparable "prediction base" with respect to grassland farming. At the present time we are unable to provide economic production guidelines specifically orientated to the soil limitations and climatic conditions associated with low productivity lands in the province.

The information developed to date with respect to methods and techniques suggested to best utilize low productivity lands is segmented and short-term. The farmers are requesting specific information in terms of development costs, associated investment costs and the expected time required to recover expenditure In other words, a clear cut picture indicating the long-term opportunity for financial gain in excess of that presently being derived under current land use.

Farmers in this area are reluctant to consider a bush removal program because in many cases the cost of clearing the bush by standard bush cutter and piler method would appear too great in relation to the possible returns which he could expect in terms of hay and pasture. Many thousands of acres of potential native pasture exist which is presently covered by bush of some type. The need in this area is for research to show the cost of different methods of bush removal which will leave the area in suitable condition for native pasture use. In this study there would be need for various follow-up treatments such as burning, spraying, piling, etc. This whole approach then has to be appraised on the type of pasture the various procedures will produce (including native as well as some broadcast seeding of tame forage species). Evaluation must be done on basis of beef production.

This type of program would be applicable to that part of the area which has soil type which would not permit any cultivation.

While admittedly a good deal of native pasture is available in the region, the rea must increase its potential for tame hay production if it is to carry its fair hare of the expanding cattle program. Therefore this aspect involves going one tep further than the native pasture program indicated very broadly above. It ould require investigation into various basic procedures to knock bush down with ie idea that such bush must be cleared. Again the various follow-up procedures ould be required. In would require seeding of the forage crop and a fertility rogram to maintain the stand. The evaluation would be on the basis of the forage roduced.

Fully co-ordinated research data would greatly reduce the problems en- ountered in bushland development on marginal lands. A reliable data source is ecessary to provide a "prediction base" on which to formulate land and credit olicies and most important of all, to provide incentive and decision at the farm evel.

PROBLEMS ENCOUNTERED IN NORTHERN PASTURE DEVELOPMENT IN SASKATCHEWAN

By - P.E. Polischuk, Lands Branch, Saskatchewan Department of Agriculture

The development of Northern bushland pastures in Saskatchewan is relatively ew. The Saskatchewan Department of Agriculture has been involved in a bushland asture program since 1957. In 1964, 21 Northern pastures will be operated and least 10 more pastures will be operated by 1966. With seven years experience uch has been learned about the development and operation of these pastures and hat problems can be expected in any new pasture we will develop and operate.

Many of the difficulties and problems are due to:

1. Lack of experience in the early years of the program.
2. Lack of information because of limited research.
3. Low productivity lands available for pasture development.

To keep land purchase costs down, the areas selected have a high proportion Crown Lands. It becomes apparent that areas selected for pasture are marginal ith small arable acreage. The low productivity and small cultivated acreage may due to:

1. Very stony land.
2. Poorly drained and swampy land unfit for farming.
3. Low productivity sandy soils.
4. Heavy bush and high clearing costs.

In the native state such areas have a very low carrying capacity and poor quality forage. Building a four strand fence around a marginal low capacity area does not make these areas into a good pasture. We consider that development of tame grasses is very necessary. These development costs are high.

The problems encountered in improving pastures depending on the type of land in the pastures. Pasture on sandy soils present the least problems in development and in operation, whereas stony till soils are at the other extreme. They are costly to improve, fence and operate. We are operating two pastures and developing two more that are so stony that we do not know what steps should be taken to improve them. We think that if there is a choice or an alternative area, we should stay away from the very stony lands unless they are to be used in their native state.

We consider our main problem is lack of research information. Operating an improved bushland community Pasture has problems that an improved farm pasture which is a part of the farm does not serve on community pasture you have a set stocking rate. Our improvement of bushland pastures consists of re-grassing cultivated field, clearing, breaking, and seeding down additional large acreages. We are faced immediately with regeneration of trees on these new fields. We do not know:-

1. How serious is this regeneration of tree growth.
2. Could it be minimized by,
   (a) Summer clearing
   (b) Delaying breaking for a year and is the delay and disruption of work timetable with higher cost justified?
3. Could new growth be controlled by heavy grazing?
4. Should we cut hay the first two years to control growth? This would require more work in land preparation. Is the added cost justified?
5. Should we use herbicides to control tree growth?

Information and research is required on species of grasses used in the pastures and how these species stand up under various conditions of grazing. We need to know what species we should seed for best grazing management. Should we use mixtures? Is a grazing rotation necessary? This involves additional fencing. Would additional cost be justified because of better and more efficient grass utilization resulting in higher carrying capacity. Should we use fertilizers and if so on what types of soils? Should we graze intensively or leave a carry over?

Furthermore, these bushland pastures are on various soil types ranging in texture from heavy clays to loamy sand and soil zones from shallow black to strongly leached grey wooded. How do various species thrive on the various soil types and different conditions of grazing? Will the results of research done on a grey wooded loam soil pasture at Garrick be applicable to a pasture on degraded heavy lacustrine clay or shallow black sandy soil? I am raising some questions for which we do not have definite answers.

All of us that are involved in pastures have our own opinions and ideas and ıe questions raised should convince you that we have given these problems a lot f thought. Decisions have been made and action taken in this respect. Whether 'e are right, time will tell. However, we are administrators. Even if we wanted ɔ do some research study, time will not allow us. Therefore, a lot of our ecisions are made in the same manner as a bush pilot flies by the seat of his ants. In other words, we observe what is happening and use our best judgement.

We have a Northern Pasture Committee appointed to study and make bservations in the pasture and to guide us in this program and I would like to ead part of this 1963 report submitted by this Committee.

"While there are some instances of under-utilization of pastures and areas ithin pastures, generally stocking rates appear to have been about right.

Regrowth does not seem to be a major problem. In the Erwood pasture, ss growth is evident than a year ago. Some fields were sprayed with 2,4-D. It ; questionable if re-working it justified to increase and improve grazing unless ıe pasture is to be used for hay. The soil is low in productivity and the best use ould seem to be as pasture. There is some indication that fairly heavy grazing ıay give a measure of control.

"On new pastures and newly developed areas in older pastures, land reparation is improving, resulting in a smoother job. This should permit mow- ıg re-growth if this becomes necessary. In general, re-growth on the pastures isited is not a serious problem at this time and is not likely to become a problem ɔr a few years yet.

"While it would be more costly to do so at the time, spacing the various perations would likely result in less re-growth and an even better job of land reparation.

"In a number of pastures it is evident there is a fertility problem and that rtilizer should be used to secure maximum production. Undoubtedly fertilizer ould give a big boost in yield and it should be possible to recover most of the ɔst through the higher carrying capacity that would result. The committee ıggests fertilizer be tried on a sizeable acreage in one or two pastures in 1964.

"In a previous report it was noted that considerable acreage in existing ıstures could be cleared, broken and seeded to cultivated forage crops. It is ɔted that this is being done in a number of pastures (e.g. Pontrilas, Donlands, ɔokson). It would seem logical to continue this policy in order to obtain aximum production of areas already fenced.

"It is evident that crested wheat grass is not well utilized in some pastures. xcepting on sandy soils it is questionable if crested should be included in the ısture mixture. It is less productive than brome in northern areas and becomes ıpalatable after early July. It could be used seeded by itself for spring pasture.

"The pasture mixture used has included about two pounds of creeping red fescue per acre. In early fall this grass is still nice and green and cattle are eating it with relish. Brome and crested wheat are finished by this time. On the surface it would appear that the fescue is a valuable component of the mixture. This may not be so. There is increasing evidence that it is tending to be dominant in a number of pastures and if this trend continues some pastures may become pure fescue. While little is known about its comparative productive ability under our conditions, in general it is not a highly productive grass. Thus if it becomes dominant it could mean lower total production.

The answer may be to remove it from the mid-season mixture, which would then be simply brome and alfalfa, and seed fescue fields separately for fall pasture. On the other hand, it may be found that Russian wild rye is more productive as fall pasture."

If research in bushland pasture development is stepped up as a result of this meeting, we would say that this has been a very fruitful and successful meeting.

PROBLEMS ENCOUNTERED IN PASTURE DEVELOPMENT

G.R. Sterling, Alberta Dept. Agriculture

Problems in pasture development vary terrifically throughout Alberta.

I. Some of the problems involved with irrigation pastures are:
   (a) Obtaining land suitable for irrigation, topography being most important because all of our irrigation areas are levelled on a border dyke system. We feel that land levelling expenses cannot exceed $75.00 - $80.00. Some of the rougher lands cannot be levelled for this price.
   (b) Another problem is to obtain a reasonable amount of dryland grazing along with the irrigation areas. The dryland is needed for spring and fall grazing when the irrigated areas are not producing.
   (c) Costs of operating the irrigated pastures are high, making it difficult to realize a 5% return on investment.

II. Dryland pastures in the south are relatively easily developed with exception that Buck Brush causes a problem in some areas and cuts down on the carrying capacity. A cheap effective method of removing this Buck Brush is needed. While we have methods of removing the Buck Brush, many feel that the return does not justify the cost involved.

III. As one comes further north, Buck Brush, Elaegnus Commutata, and Scrub Poplar are not involved.

IV. Farther north, generally a line through Camrose, Wainwright, and south along the Foothills, the problems encountered are trees and rather heavy brush. Many of these areas also involve a rather rough topography which increases the cost of mechanical land clearing. Much of these areas are also grey wooded soils, and in some cases sandy soils, which are not too productive from a forage standpoint. These soils generally necessitate the use of commercial fertilizers.

At the moment we anticipate that it will be necessary to change rather
rge areas from tree and brush cover to grass cover. Our problem is to do this
the cheapest way possible in order that we will have areas producing grass and
t regrowth of poplar, willow, or other tree-like plants.

arch 31, 1964.
pared for Regina Meeting.

Problems Encountered in Pasture Development

By W.B. Herringer, P.F.R.A.

The problems in pasture development are almost identical regardless of
at agency is carrying on the development work. For the past day and a half we
ve been listening to various speakers talk on the aspects of northern pasture
velopment and their related problems. I will attempt to outline some of the
oblems that the P.F.R.A. is confronted with, realizing that you have already
ard much of this before.

I will list the problems and discuss them very briefly.

Finances - as with many other operations the limiting factor to pasture development is the availability of money. If the money supply was unlimited the problems would dissolve very quickly. I don't believe there is any problem that could not be solved if we had the money. We must be realistic and realize there are many demands for government funds and therefore we will have to get along as best we can with the funds available. could possibly come under ARDA assistance.

Land Clearing & regrassing - Our knowledge of the most efficient land clearing methods is limited as is our knowledge of regrassing and grass management following the land clearing operation. There should be more economical & efficient methods of land clearing. There should be more study of the merits of two methods of handling bush pastures - intensification and extensification. I believe in intensive type of grass management rather than the extensive method. I would sooner see 5000 - 10,000 acres cleared and regrassed carrying 5000 head of cattle than 40,000 - 50,000 acres of bush carrying the same number or less. The money spent on fencing a larger area could better be spent on developing a smaller area to a higher degree of finish.

Once we have the land cleared and regrassed we need to know the best methods for keeping it in a highly productive state by the proper use of chemicals for regrowth control and the use of fertilizers for greater forage production. It is senseless to spend anywhere from $25.00 to $45.00 an acre on a clearing and regrassing program and in ten years have your land completely covered with bush again. This is a problem we have to face. We need more research and study on how to overcome it.

We believe there should be research done on seeding of Native species especially for prairie pastures. Crested & Russian W.R. are excellent grasses but their use is limited. We need more work on this.

3. Fencing - Our fences are costing us too much money. We must find cheaper and better construction methods for fencing under all conditions. I believe we should be using suspension type fences where they are practical. For the past twenty-five years the P.F.R.A. fences have been held up as models of fence construction. This is as it should be, because they were the best fences constructed in Western Canada. Times have changed however. No longer can you get a man to set and tamp a post for .75 per hour. We realize this and are thinking now in terms of driven posts, suspension fences and any other type of fencing that will cost less and at the same time do the job it is supposed to do. I'm sure it is possible to knock off at least $200.00 per mile. In a 20,000 acre pasture this would amount to a saving of approximately $8,000 - $15,000. We can do a lot of clearing and regrassing with that amount of money.

4. Pasture Location - More study could be done on pasture locations in regard to existing cattle numbers and proximity of other pastures. I believe the provincial governments and P.F.R.A. should work closer together so that we do not run into the situation of having too many pastures and too few cattle in any one area. The demand should be there is terms of cattle numbers before the pasture is built.

5. Fireguarding - You can spend up to $400.00 per mile in developing a 150' wide fireguard area in bush pastures. It will cost you about $20.00 per mile to maintain a 22' fireguard strip within this area. This is a job that must be done every year. It is time consuming and costly. If the use of soil sterilants could be developed on an economical basis for this job it would reduce it from a yearly operation to a once every four or five years operation. More research is needed so that we can determine the proper mixtures and methods of application.

6. Range Management - We need to know much more about handling grass and cattle in order to attain maximum production from our pastures. Our research men are constantly looking for improved species of grasses and legumes for use on our pastures. The pasture manager can play a big part in range management by studying and improving cattle distribution over his pasture. Salting can improve distribution when used to draw cattle into area not usually grazed. Salt ground locations should not be considered sacred or permanent. Areas served by temporary spring water supplies should be salted first. Salt can be placed to encourage or delay grazing within units to bring about greater uniformity in forage use.

The manager should get to know what species and areas are best grazed at certain times of the season. He can then distribute his cattle accordingly.

Water development, fencing, salting methods and range riding are all ways of improving cattle distribution in a pasture.

The alert manager recognizes that improving cattle distribution is one of the most effective ways to increase the carrying capacity of his range.

I think its very important that we have managers with cow sense & grass sense. He as the man on the job. He can make or break your program.

These are just a few of the problems which we encounter in the development of community pastures. There is much that research people can do to help us do a better job.

The P.F.R.A. will be only too happy to assist in any way that we can.

PASTURES FROM BUSHLAND

Recommendations

The meeting divided up into 3 groups (British Columbia and Alberta; Saskatchewan; and Manitoba) to discuss problems and recommend where research was needed to solve or assist with these problems as they applied to the Peace River block (British Columbia and Alberta), central and northern Saskatchewan, and in the Interlake region of Manitoba.

The following were the suggestions for research and other studies on an area basis:-

British Columbia and Alberta

1) Before a new community pasture is established a productivity study should be conducted to learn something of the cost of bush clearing, the type of soil, and the potential of the soil to produce forage.
2) Increase research on the control of tree regrowth.
3) Continue present research and initiate new research on the establishments of forage stands on northern meadows, and shallow organic soils.
4) Consolidate present information on brush clearing techniques - a bulletin on brush clearing would be useful.
5) Intensify the work of plant breeders on native forage species.

Saskatchewan (not in order of priority)

1) Studies should be intensified on methods of destroying trees before establishments of forages and for preventing tree regrowth in established stands of forage crops.
2) An ecological study of the poplar tree should be initiated.
3) Further work is needed on the establishment of forage mixtures on broken land and on unbroken land.
4) More work is needed on forage mixtures for different animal needs and management practices and different soil types, including consideration of native species.
5) Further studies on the use and need of fertilizers on bushland soils are needed to establish the economical feasibility of increased fertilizer use.
6) Productivity of pastures in terms of animal gains and degree of finish of market animals is needed.
7) Certain disease problems such as foot rot are causing trouble on many pastures and require study.

Manitoba

a. Immediate needs

1. Further research on forage mixtures, establishment of stands, seeding rates, and fertilizer needs for maximum production as these apply to hay and pastures in Parkland areas.
2. An economic evaluation of methods of land preparation and the resulting productivity is needed.
3. More information on climatic data in many areas where pastures are being established would be valuable.

b. Long-term studies.

1. Study methods of development of pastures from bushland to establish a benefit-cost ratio in terms of productivity.
2. More work is needed on pasture production in terms of animal production. This would include fertilizer application, forage mixtures, animal management, etc.
3. Methods and costs of brush regrowth control require further study.
4. Studies are needed on the further development of presently cleared land - can cereal cropping of this land be an economic proposition in the re-establishment of worn-out pastures.
5. Work is needed on alternate land use in poorly drained areas such as peat lands.

After the meeting discussed the problems presented by the 3 groups the following recommendations and suggestions were made concerning research and testing that would be desirable in furthering the work of increasing the productivity of bushland areas by livestock:-

1. There is an immediate need for information on cost-benefit ratio in establishing community pastures and in assisting the individual farmer in determining the merits of clearing bushland and establishing pastures of greater productivity. This would include studies on relative costs of clearing trees by different methods, forage stand establishment, fertilizer needs, weed control, animal management (intensity of grazing, continuous vs. rotational grazing), etc. (It was mentioned that although the primary benefits are important, the importance of secondary benefits to the individual farmer to the community from the establishment of a community pasture or clearing and establishing more productive pastures on an individual farm basis should not be ignored).
2. Weedy regrowth (mainly poplar trees) on pastures established after clearing bush is an important problem and requires more research.
3. More ecological studies are needed to determine plant succession of native and cultivated species as influenced by intensity of grazing, fertility, nearness to native bushland, etc.

4. The establishment of forage species in organic and shallow meadow soils needs further study.

The provincial departments of agriculture and P.F.R.A. expressed willingness to co-operate with research workers in making land, cattle and equipment available for research projects.

F. Whiting
Research Coordinator
(Animal Nutrition)

J.E.R. Greenshields
Research Coordinator
(Forage Crops)